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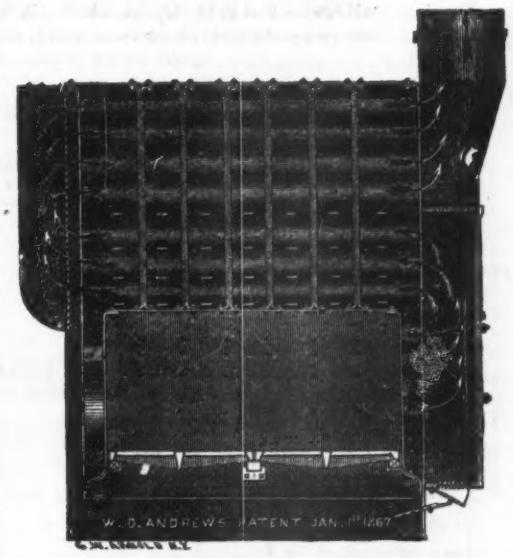
The Andrews' Boiler.

THIS boiler, which is shown in the accompanying illustration, has been designed to apply the principles which govern the use of fuel in the form of gas. Gas generators as applied to heating purposes accomplish a partial combustion of the fuel, differing in this from retorts for making illuminating gas, in which the fuel is only distilled and the product is entirely unconsumed. Perfect combustion consists in the union of 2 parts of oxygen with 1 of carbon; in imperfect combustion only one part of oxygen unites with a unit of carbon. The advantage of first performing this partial combustion, and then burning the product thus obtained rests upon a remarkable property of carbon. Although the amount of oxygen added in the first burning is just the same as in the second, the heat produced by the first is very much less than that produced by the second combustion. The figures are the following: Carbon produces when burned to carbonic acid (CO_2) 8080 units of heat; when burned to carbonic oxide (CO) 2474 units. This leaves 5606 units of heat as the product of the second combustion, or more than twice that of the first burning. This result of theory is proved to be true by experiment, and it is also found that the temperature as well as the quantity of heat is very much higher when CO is burned instead of pure C. It is supposed that the cause of this apparent paradox lies in the fact that we can supply air much more perfectly to the gas than to the solid fuel, and therefore can obtain more thorough combustion and a higher heat.

MESSRS. ANDREWS & BROTHER accomplish this result by burning the fuel as usual in a grate, the air to which is admitted from below; while the door to the coal box is perforated with apertures provided with regulators which admit air to the surface of the coal. Combustion in the grate produces CO and CO_2 while the air which enters to the heated gases finishes and perfects the combustion. In other respects the boiler is provided with the usual improved appliances in boiler making and is in every way an efficient and economical machine.



THE ANDREWS' BOILER.

Gold in Sea-Water.

BY E. SONSTADT, in *Chemical News*.

CONTINUED FROM PAGE 387.

III. The method that I give last was that whereby I first obtained evidence of the presence of gold in sea-water; but this method is open to objection, as being more troublesome than the preceding methods. To at least a litre of seawater, contained in a stoppered bottle, a few grammes of ferrous sulphate are added, and after two or three days, some solution of stannous chloride, followed by solution of mercuric chloride, taking care that the latter is added in such proportion that the water is still capable of separating mercury from more solution of mercuric chloride. Neither the precipitates caused by ferrous sulphate nor by stannous chloride, in sea-water, carry down with them more than a small fraction of the gold present in sea-water; but when the mercuric chloride is added to the water already containing stannous chloride, mercury is precipitated in the liquid, and, as it subsides, carries down with it both gold and silver as an amalgam. The ferrous sulphate may be dispensed with, but then a larger proportion of stannous chloride must be used, and this oxidises so rapidly in sea-water that there is danger of re-solution of its precipitated gold by iodine, as mentioned at the beginning of this paper. The precipitate, if tin and mercury salts only have been used, may be ignited, and assayed in the usual way, and the bead obtained treated as described under II. The assay is, however, troublesome, owing to the large proportion of tin oxide to be treated. But if the precipitate contains iron oxide, the usual method of assay will fail, because during the process of smelting, iron oxide is reduced to the metallic state, even at a low red heat; and the spongy iron locks up the gold and silver away from the lead. Hence, in assaying substances containing much iron oxides, it is necessary, as far as possible, to prevent reduction of the iron by using only borax as the flux, and that in proportion large enough to hold the iron oxide in complete solution. The oxidating and not the reducing flame of the blowpipe must be used upon the assay.*

The reagents used in all these experiments were not only severely tested separately as to freedom from the precious metals, but in each set of experiments on the sea-water, entirely correspondent experiments were made upon rain-water, always with negative results.

I have referred to the solvent action of very dilute solutions of iodine upon gold. The following experiment illustrates this action. A little precipitated gold was added to strong hydriodic acid, slightly colored by iodine but otherwise quite pure. The acid quickly became opaque. A drop or two of the solution added to a rather strong solution of stannous chloride in a test-glass immediately caused precipitation of purple-of-cassius, the supernatant liquid being colorless, and remaining so on addition of more tin solution. After a few days' exposure, the liquid smelt of iodine; and then addition of more tin salt caused instant separation of purple precipitate; proving that the iodine liberated had dissolved some of the precipitated gold. After another day or two of exposure, gold was again in solution, and was precipitated by further addition of tin salt, and this was repeated several times; and evidently the re-solution of the gold would have gone on indefinitely after successive precipitations.

As gold is very readily reduced from highly dilute solution by the action of organic matter and of sunlight, it was important to ascertain wherein sea-water differed from ordinary water in its action on gold, or, rather, wherein lay its power to retain gold in solution in presence of organic matter. This power was proved to reside in the iodate of calcium present in sea-water by the following direct experiment.* A drop of gold solution was added to about 400 c. c. of rain-water, and the solution was divided into two

* Some years ago, having occasion to make a great number of assays for the precious metals in specimens taken from the mountains of Reumammawr, in North Wales, I was greatly puzzled by the conflicting results obtained with the same reagents, but under different modes of working. Specimens smelted before the blowpipe always gave much higher results than those that were treated in crucibles. For in the former case I used only borax as a flux, and in the latter, to make the mixture more fusible, and also to ensure a good button of lead, I used, besides borax, carbonate of sodium or of potassium and charcoal powder. Nevertheless even in the latter case, beads of auriferous silver containing also platinum were always obtained; for the proportion of iron oxides contained in the mineral was not large enough entirely to prevent the solvent action of the lead upon the precious metals. But more recently on assaying a series of red hematite ores found in the Isle of Man, I obtained from some specimens treated before the blowpipe, with a good proportion of borax, as much as 16 ozs. silver to the ton; while the same specimens smelted in crucibles as described, left a spongy mass of iron, and the lead button contained no silver. I repeated the experiments often enough to leave no doubt respecting the cause of these discrepancies being that referred to in the text. I also sent samples of these ores, containing from 4 to 16 ozs. silver to the ton, to eminent assayers, who informed me that they contained no trace of the precious metal.

* I do not by this mean that solution of iodate of calcium has any power to dissolve gold, or to retain it in solution when dissolved by any *direct* action. But, as has been shown in former papers, putrescible organic matter causes liberation of iodine in a neutral or slightly alkaline solution of iodate of calcium, and the iodine thus liberated continuously dissolves the gold that is being continuously precipitated, if such an expression referring to nascent conditions may be permitted. It is clear from the experiments given in the text, that organic matter is capable of precipitating gold *earlier* than the stage at which that balance of destructive and conservative forces always at issue between organized and inorganic matter arrives, at which iodate of calcium begin to decompose, such decomposition leading the liberation of iodine, which, as shown, reacts upon any precipitated gold to dissolve it. From these premises we may easily see how, although sea-water must always retain some gold in solution, it may yet, under circumstances not only conceivable, but such as must necessarily occur in regions where the passage of organic matter to a state of putrescence is too rapid for the *formative* power of the iodate of calcium in sea-water to keep pace with it, cause precipitation of gold. Hence it is, as it appears to me, that gold-fields are found richer in tropical regions where decomposition goes on at a quick rate, than in colder regions where the re-forming power of iodate of calcium can exercise a more powerful solvent action upon the gold which sea-water has extracted from the original material of which the earth is composed.

equal parts, to one of which a tenth of its bulk of solution of iodate of calcium containing 1 part iodate to 1000 of water was added. A drop of the same gold solution was added to 400 c. c. sea-water, and another drop to a corresponding quantity of iodate of calcium solution. The beakers containing the four solutions were placed, uncovered, in sun-light. All the solutions except that of sea-water became perceptibly colored after a few hours, and next day were distinctly ruby-colored, the sea-water remaining colorless, except the pure solution of gold, which remained permanently colored. The disappearance of the coloration could only arise from solution of the precipitated gold, since subsidence was out of the question. Ruby liquids so dilute as these I have found not to lose color by subsidence for months. Many similar experiments have been made under varied circumstances, all showing that solution of iodate of calcium has absolutely no solvent action on gold, nor even the power to prevent its reduction from solution. But so soon as the iodate itself undergoes partial decomposition under the influence of putrescible matter, iodine is liberated, and gold, if present, is dissolved. —*Chem. News.*

Utilization of Coal Waste.

BY E. F. LOISEAU.

An article on the "utilization of waste coal," very ably written, appeared in the October number of the *American Exchange and Review*, and was reproduced by almost all the American scientific papers. The anonymous author of this article has evidently studied the subject carefully, and his objections to the different processes which have been tried to solidify coal dust, are serious ones; but his knowledge of the facts seems to be limited entirely to what has been tried in this country, and he seems to possess only some general information about what has been done abroad.

Alluding to the manufacture of artificial fuel in Europe, the author of the article referred to says, that "for a number of years, the bituminous or semi-bituminous waste from the mines of Germany, France and Belgium, has been to a considerable extent successfully utilized, by mixing with it from 15 to 30 per cent. of ordinary moist clay, and pressing this plastic mass into forms of any desired shape and size. The product, thus obtained, though of inferior heating quality, still secures a ready market, owing to the *high price of the coal* in the countries named, where it finds employment, not only for household purposes, but also for steam generation."

Not only is the dust of bituminous and semi-bituminous coal consolidated with clay in Europe; but in Belgium, at the mines of Baulet, Auvelais, Hamsur-Sambre and Tamines-sur-Sambre, the dust of a very dry coal, called stone coal, similar to anthracite, is also manufactured into solid lumps by a clay mixture. In France, in the department of Izère, at La Sable, Vizille, Arroux, where pure, vitreous and specular anthracites, resembling those of Pennsylvania are mined, the same process is applied. It is also applied in South Wales. It is not the *high price of the coal*, which secures to the artificial fuel, thus made, a ready market, it is its lasting qualities; its regular size, its being free from slate, sulphur and other impurities, and giving no smoke. The slack coal in Belgium, is not worthless as it is here; it is used for baking bricks, tiles, &c., &c., and its price is only *thirty per cent.* below that of coal. The artificial fuel costs as much as the ordinary coal and sometimes more; still, it is preferred to the ordinary coal.

The manufacture of bituminous and semi-bituminous waste into solid lumps by the use of coal tar as a cement, has long ago been abandoned in Europe. Fluid pitch is still used at La Chazotte, France, but all the other factories of France, England, Germany and Belgium are using either clay or the residuum of coal tar, submitted to boiling until it is freed of from 50 to 60 per cent. of its volatile matters; it then constitutes dry pitch. This pitch is ground, mixed with the coal dust, in the proportion of about 8 per cent., conveyed by a propeller screw, through a heated cylinder which softens the pitch, into a mixer, and from this mixer to a press, to be moulded into lumps of suitable sizes.

Although the lumps are submitted to almost complete carbonization, this coal is unfit for domestic purposes. It answers well for steamers, locomotives, etc., and it does not disintegrate, while burning, as the coal cokes before the pitch is consumed; but when pitch is mixed with anthracite coal dust, and pressed into lumps, these lumps disintegrate in the fire and the particles of coal fall through the grate, without being consumed.

Some manufacturers, and among them, JOHN CHRISTIE and THOMAS HARPER, in England, and EUBYALE DEHAYNIN, in France, thought that by more mechanical combination of materials, they could obtain results equivalent to a chemical change in the ingredients themselves; thus, that by the mixtures of anthracite and bituminous slack, a fuel could be obtained corresponding in its properties to steam, or semi-bituminous, coal; or that by mixing a good with a very poor coal, a fuel of a fair average quality could be obtained. Nothing could be further from the truth, for mere mechanical combination can in no way alter the nature of the several ingredients used. In the fuel thus made with a mixture of coals, each particle burned in the precise manner, and gave the results due to the peculiar seam from which it was taken, whilst the pitch used for combining the small particles of coal gave out, in like manner, the flame, heat or smoke due to its combustion under similar circumstances when not forming part of a block of artificial fuel.

The process of manufacturing artificial fuel from bituminous or semi-bituminous coal dust, by cementing the particles with pitch, would be as successful in this country as it is in Europe, if the price of the coal were higher than it is to-day; at the actual low price, it would not be a remunerative business. The same difficulty would exist in the application of the process to anthracite waste, even if a perfect product could be made.

Having described the process of BESSEMER in England, for consolidating bituminous coal dust without any cement, by heating the dust to a semi-caked, plastic condition and pressing it afterwards in suitable moulds, the author of the article says that "this plan has received considerable praise from scientific critics, of which it is indeed well worthy. It is now stated *to be in successful operation* in several large manufactories in England."

Scientific critics have praised the process, it is true, but the practical application of it has been a failure. Although BESSEMER'S process has been considerably improved by EVRARD and BAROULIER in France, the expensive machinery required for its application and the defects of the fuel produced, which had a great heating power, but could not bear transportation, were sufficient causes for the abandonment of the enterprise. There does not exist, to day, on the continent, a single establishment, where the manufacture of artificial fuel from coal waste, without cement, is carried on.

Although the writer of the article objects strongly to the use of mineral cements, he seems to think that several American processes for utilizing coal waste by the use of *grahamite* as a cement, may ultimately prove successful.

Grahamite is an asphaltic mineral found in West Virginia; it may be classed with the albertite of New Brunswick and the bitumen of Trinidad. Like these, it expands when submitted to elevated temperatures and it emits, while burning, the same unpleasant odor and smoke, which made the use of coal tar pitch, as a cement, so objectionable in a fuel prepared for domestic use. Any kind of asphalt would answer as well as pitch to manufacture from bituminous coal dust an artificial fuel for manufacturing purposes, if the low price of the coal were not, as it is now, an insuperable difficulty. Applied to anthracite slack to manufacture an artificial fuel for the same purpose, asphalt will not answer, on account of its tendency to expansion, and for household purposes, it will not answer better than the pitch, on account of the smell and smoke. There remains the long-tested and cheaper process of cementing the coal dust with clay.

The first experiment in the manufacture of what is termed "Artificial fuel" appears to have been made about the year 1594, when SIR HUGH PLATT attempted to introduce into England, for use in common fireplaces, a mixture of coal and clay, which he states to have been according to the manner of "LUKELAND in Germany." He also used other mixtures, such as small coal with saw-dust, tanner's bark, held together with loam or with cow's dung. These are set forth in a work published in 1603 and entitled "a new, cheap, and delicate fire of coal-balls, by H. PLATT."

No further experiments appear to have been made in this direction for nearly two centuries, when on December 16, 1799, JOHN FREDERIC CHABANNES obtained an English patent for separating the large coal from the small coal, by passing the latter through sieves or gratings, made of wood or metal, and then consolidating the small coal by mixing it with clay, cowdung, tar, pitch, etc., etc., to be mixed together and ground with a wheel in water, in a wooden vessel. This mixture he afterwards placed in pits, provided with drains for the water to run off, and then, when almost dry, moulded the mass into cakes of a considerable size.

Since 1799, clay, conjointly with various resinous cements, has been used and patented in European countries by a number of so-called inventors. Among the most prominent, were Levy, Stafford, Oram, Goodwin, Drouet, de la Chabeaussiere, Geary, Mohum, Stirling, Dominick, Holcombe, Smith, Hollands, Whitaker, and others. The clay was added to the mixture in order to counterbalance, by its tendency to contract when heated, the tendency of the resinous materials to expand. The resinous materials were added to the clay, to make the fuel manufactured burn better and to render it impervious to moisture. The admixture of resinous materials with the small coal and the clay spoiled the fuel, by the bad odor and smoke which it made while burning, and at the same time, increased considerably the cost of manufacturing solid coal from slack.

While the inventors were trying to find some kind of cement which would hold the particles of coal firmly together until entirely consumed, without emitting smoke or odor, the people in the mining regions of England, France, Germany and Belgium, feeling the need of a cheap and lasting fuel, were buying the small coal at the collieries, and adding to it from 30 to 40 per cent. of clay, with sufficient water to moisten the mixture, worked it into a pasty mass, with shovels, and by trampling upon it with wooden shoes. (In some parts of Germany, it is trampled upon by men on horseback.) This pasty mass was simply pressed by hand in the shape of balls or eggs, dried in the sun, and stored under shelter until used.

It will easily be perceived that such an addition of clay increases considerably the quantity of ashes and reduces the combustible character of the coal. For the last few years it has been manufactured mechanically and the proportion of clay has been reduced in Belgium to 20 per cent.

The only objection made to the clay process in the article referred to is that "it must prove unsuccessful, from the fact that the combustible character of the coal waste, is so considerably reduced by the mixture with it of from 10 to 20 per cent. of non combustible materials, that the product can only be burned with difficulty, necessitating either constant attention or an artificial draught." This objection is well founded when applied to even the most improved European methods, but it looses its force when applied to my process, by which the proportion of clay is reduced to 5 per cent, and the fuel manufactured rendered impervious to moisture by

an outside coating, thus preventing its gradual deterioration in heating qualities when exposed to the combined action of air and moisture. It will be conceded that 5 per cent. of clay in the fuel is less objectionable than the presence of from 5 to 10 per cent. of slate, and sometimes more. If the intensity of heat given by artificial fuel made with clay is not equal to that of the ordinary coal, it lasts longer, and it may safely be asked, if for domestic purposes, this will not be an advantage rather than a defect.

As before stated, clay, as a cement, can be applied to anthracite as well as to bituminous slack; the European factories demonstrate this to evidence. It only requires appropriate machinery to demonstrate the fact in this country.

Before concluding this article, I wish to say that, in my opinion, the manufacture of artificial fuel from bituminous slack and clay is destined to revolutionize the manufacture of iron in the bituminous coal regions. No bituminous coal, except the block coal used in the Brazil furnaces, in Indiana, can be used for smelting, without being previously coked. It is coked for two reasons: 1st. For the purpose of converting it into a fuel deprived of its volatile constituents, which does not become pasty when ignited and does not run and cake together. 2d. For the purpose of eliminating from the coal a portion of the sulphur contained as pyrites. Now, it is a well known fact that the slack or coal dust contains a very small proportion of sulphur, hardly any. Scientists and practical metallurgists almost unanimously agree that the sulphur contained in the coal combines with the iron in the furnace only at a low red heat, and it may safely be asserted that the small proportion of sulphur contained in the artificial fuel would be eliminated and the coal coked in the furnace before this combination could take place.

Basing my statements on experiments, I will add that bituminous slack, mixed with clay and moulded into lumps, will not run and cake together; that its tendency to expand will be counterbalanced by the tendency of the clay to contract, and that in any kind of heating apparatus, stove, grate or furnace, it will coke gradually from the outside surface to the center, each lump becoming, so to say, a small retort, the gases escaping through a heated surface and being consumed, instead of escaping into the flue; the coal throwing no sparks from the grates and emitting a light, grayish smoke, instead of the black, dense smoke peculiar to the bituminous coal

Captain Ericsson on Torpedoes.

LETTER ADDRESSED TO THE SECRETARY OF THE NAVY.

NEW YORK, December 10, 1872.

SIR: I beg to call your attention to the accompanying description of a movable submarine torpedo, a copy of which I forwarded April 13, 1870, to Vice-Admiral Porter and to the Chief of the Naval Bureau of Ordnance. I also, at the same time, forwarded copies of the said description to the Committees of Naval Affairs of the Senate and of the House of Representatives, in order that Congress as well as the Navy Department, might be informed of the fact that a submarine torpedo had been devised capable of being propelled under water and directed to any desirable point. The description of the movable submarine torpedo having thus been placed before the executive officers of the Navy Department and before the Naval Committees of Congress, it was taken for granted, in view of the simplicity and obvious efficacy of the device, that the Navy Department would at once order an investigation of this new system of coast defence. It will be proper to mention that I was fully prepared at the time of forwarding this description—and have been ever since—to construct the torpedo, at my own cost and risk, complete for practical test. Nor will it be irrelevant to advert to the fact that I have been urged by persons well-acquainted with the state of the naval defences of the country to present a special application to the Department. Had the description referred to not been sufficiently clear to enable the officers of the Department to form a correct judgment of the nature of the invention, it would have been my duty to adopt the course suggested; but, since the detail of the mechanism was described with such minuteness that any skilful engineer could construct the same, the inaction of the Department in the matter rendered the inference irresistible that a movable submarine torpedo does not form part of the means by which it is intended to defend the coast and harbors of the United States. The recent official trial of a torpedo boat at Newport indicates, however, that it is not intended to dispense with moveable submarine torpedoes for coast defence. Accordingly I have respectfully to state that I will forthwith construct such a torpedo agreeably to the accompanying description, provided the Department will do me the favor to appoint a board of naval officers with instructions to institute a rigorous comparative test of the efficiency of my submarine torpedo and that of the torpedo boat referred to, built by Messrs. CLUTE.

Thinking that an exposition of the main features of the rival inventions—the torpedo boat and the moveable submarine torpedo—might influence your decision, I have the honor of submitting the following statement:

1. The torpedo boat, floating at the surface of the water, will be easily crippled by a watchful enemy, even in a calm, while in a seaway its destruction will be inevitable.

2. The submarine torpedo, being immersed from fifteen to twenty feet below the surface of the water (regulated according to the draughts of the vessel attacked,) will advance towards its destination in spite of watchfulness and a rough sea.

3. The explosion of the torpedo boat takes place too near the surface to affect seriously an iron-clad ship carrying twelve inch thick armor six feet below water line.

4. The submarine torpedo explodes near the bottom of the vessel struck, at a depth where the pressure and resistance of the surrounding water renders the force of the explosion so great that a charge of 400 pounds of nitro-glycerine will wholly destroy the lower part of the structure. The adopted water compartment system will therefore offer no protection against the effect of such an explosion.

5. The motive power of the torpedo boat is of a dangerous nature owing to the enormous pressure of the acting medium, 600 lbs. to the square inch. At best it is insufficient, and ceases the moment the small quantity of carbonic acid capable of being carried is consumed. Any mischance, calling for prolonged action of the propeller will exhaust the motive power, hence the craft will be useless in such a case, and inevitably lost, no means having been devised for bringing it back.

6. The motive power of the submarine torpedo, atmospheric air under moderate pressure, is safe and reliable. It acts with undiminished energy during any desirable length of time, being supplied by stationary engine power; hence any occurrence calling for prolonged action of the propellers will occasion no embarrassment. Should the enemy avoid contact by manœuvering or retreat, the torpedo will be brought back by turning the reel, an operation effected also by engine power. During contest, a rapid retrograde movement (impossible with the torpedo-boat) may be effected whenever requisite, simply by putting the reel in motion as stated.

7. The means adopted to start, stop, and steer the torpedo-boat, involve mechanism of an unusually complex and delicate nature. Two insulated wires required are connected with a galvanic battery on shore and coiled round a reel on board of the boat. The electric currents are regulated by a dial-plate and keys, the handling of which requires experience and the strictest attention on the part of the operator, who, unable to watch the course of the torpedo-boat himself, must follow the instructions received from another person. Three motors are necessary to put the propeller in motion, viz.: (1) a small magnetic motor to open a valve admitting carbonic acid gas into (2) a small engine, the power of whose pistons opens a valve for admitting gas into (3) the main propeller engine. The steering is effected by two separate pistons operated also by the carbonic acid gas admitted by valves moved by galvanic agency. The pistons last mentioned put the helm hard up or down; but in going straight ahead, the rudder is kept in position by some arrangement, the nature of which has not been published. Another important device, the particulars of which have not yet been published, is necessary for lifting water into a chamber at the bottom, to make good the weight lost as the wires are reeled off during the progress of the boat. Other necessary devices connected with the mechanism of the torpedo-boat might be pointed out; for instance, in order to prevent the great loss of motive energy attending the reduction of temperature during expansion, the carbonic acid gas is passed through a system of pipes intended to abstract heat from the sea and transfer the same to the frigid motive agent. Considering the high pressure employed, and the great number of pistons, valves and joints connected with the torpedo-boat, all of which must be perfectly tight, Messrs. Clute deserve great credit for their excellent workmanship.

8. The submarine torpedo is controlled altogether by the handle of the stop-valve, which admits air into the tubular cable. When this handle is placed in a vertical position, the torpedo moves directly ahead; inclined to the right, the helm is put hard up, and when inclined to the left the helm is put hard down. By intermediate degrees of inclination of the handle, the rudder may be placed at any desirable angle. By bringing the handle to a horizontal position the air is shut off from the tubular cable, and the torpedo stops. The steam-engine employed in charging the air-receiver which supplies the tubular cable, also turns the reel. Accordingly, the torpedo may at any moment be hauled in with great rapidity, or caused to perform a retrograde movement during contest, by simply throwing the reel in gear. It is scarcely necessary to contrast this simple mode of controlling the submarine torpedo with the intricacy involved in the system of effecting the object by electric currents and small motive engines operated by carbonic acid gas, in the manner described. The fragile character of the insulated wires, and the liability to derangement of mechanism of such complex and delicate nature, need no comment.

I would respectfully call attention to the fact that the trial at Newport was conducted at high water under exceptionally favorable circumstances, and that the drifting of the boat, after stopping the motive engine, was resorted to at last in order to reach the mark, showing that the absence of means of effecting a retrograde movement is a serious if not fatal defect.

9. The torpedo-boat, although too small to carry sufficient motive power, and incapable of running at high speed, is twenty-five feet long and three feet in diameter. Evidently such a body is too heavy to be handled with facility, while an adequate supply of such cumbrous and complicated structures in time of war will involve numerous difficulties.

10. The movable submarine torpedo is 19 inches in diameter, and ten feet long, the shell being composed of light galvanized iron. It is provided with an engine which transmits to the propellers the motive energy conveyed through the tubular cable. At medium pressure fully fifteen-horse power will be developed. Of course a considerable portion of this motive energy will be consumed in towing the cable; but the torpedo itself, the section of which is less than two square feet, requires for its propulsion only a fraction of the stated power. It merits a special notice that two propellers are employed, turning in opposite directions, an expedient indispensable to counteract the torsion produced by the great amount of motive power applied. Obviously, the torpedo will revolve in the water unless the tendency to rotate be prevented by the expedient of turning the propellers in contrary directions.

In conclusion, I have the honor to inform you that a trial has just been conducted in the bay of New York, for the purpose of ascertaining practically what amount of motive energy is consumed in towing a tubular cable of adequate size to transmit the intended power. The result of this trial has established the important fact that a tubular cable half a mile in length, towed at a rate which will give a mean velocity of ten miles per hour to the submarine torpedo, consumes one-third of the motive power capable of being transmitted through the cable. I have also the honor of informing you that the seemingly difficult problem of running the torpedo across tidal currents, has been satisfactorily solved. I am sir, your most obedient servant,

J. ERICSSON.

Researches on the Consumption of Heat in the Blast-Furnace Process.

BY RICHARD AKERMAN.

Translated by FREDERIC PRIME, Professor of Metallurgy in Lafayette College, Easton, Pa.

CONTINUED FROM PAGE 388.

Finally, attention may be particularly drawn to the following comportment. Since from the circumstance that the action of the heated blast on the consumption of coal depends upon the quantity of air blown in per weight-unit of pig iron, and this, in turn, is based on the amount of coal required for the same unit which has to be burnt by the blast, the saving in coal obtained through the hot blast—provided the same is calculated not in per cent. of the fuel requisite with cold blast, but by measure or weight—will become relatively less as the consumption of coal is smaller when working with cold blast. From this it further follows that it cannot be demanded for each degree of heat by which the temperature of the blast is increased that the same saving of fuel in tons or pounds shall be attained, but rather that in proportion as the number of degrees increases the saving of fuel must be somewhat less, since the gain in fuel amounts to about the same per cent. as the decreased amount of coal for each degree of the increased temperature of blast. But in proportion as the consumption of fuel, calculated by volume, is less than the temperature of the blast rel-

atively increased in degrees, so does the burden of ore that can be charged, by an unaltered charge of coal, relatively surpass the same temperature of the blast. This can be seen from the following example. Let it be assumed that with an increased temperature of blast of 100° C. the saving of fuel amounts to 10 p. c. of the quantity of coal previously required, and let the amount of fuel consumed per hundred-weight of pig iron and at 0° C. temperature of blast be designated by a, and the burden of ore charged to this quantity of coal by b. It will be found:

At 0° C. temperature of blast.		The consumption of coals.	The saving of coal.	The ore burden b
"	100°C "	0. 90a	0. 10a	1.11b
"	200°C "	0.9×0. 90a=0. 81a	0. 19a	1.23b
"	300°C "	0.9×0. 81a=0.729a	0 271a	1.37b
"	400°C "	0.9×0.729a=0.656a	0.344a	1.52b
"	500°C "	0 9×0 656a=0 59a	0. 41a	1.69b
"	600°C "	0.9×0. 59a=0.531a	0.469a	1.88b

The saving in coal for every 100°C which the temperature of the blast is increased amounts therefore—

For the first 100°C to (0. 10—0. 0)a=0. 10a
" second " " (0. 19—0. 10)a=0. 09a
" third " " (0.271—0. 19)a=0.081a
" fourth " " (0.344 -0 271)a=0.073a
" fifth " " (0. 41—0.344)a=0.066a
" sixth " " (0 469 0. 41)a=0.059a

While the burden of ore charged into the furnace with an unaltered charge of coal—

For the first 100°C increases (1 11—1.)b=0.11b
" second " " (1 23—1 11)b=0.12b
" third " " (1 37—1.23)b=0.14b
" fourth " " (1 52—1 37)b=0 15b
" fifth " " (1 69—1.52)b=0.17b
" sixth " " (1.88—1.69)b=0.19b

XXXIV. It has already been shown that heat is carried into the furnace by heating the blast, without simultaneously increasing the quantity of gas. If now it be assumed that the endeavor should be with the use of hot blast to obtain as nearly as possible the same quality of pig iron as when using cold blast, the burden of ore will have to be raised as high as the desired quality of pig iron and a good working of the furnace demand. So that in any case, with an unaltered charge of coal and the use of hot-blast, the burden of ore will be greater than with cold-blast; and consequently, when using the former, the quantity of gas passing off from the blast-furnace will be less per weight-unit of ore charged than with the latter. But since the reduction of ores is chiefly effected by the gases, this reduction is rendered more difficult in proportion as the quantity of reducing gases becomes relatively less than the ores. The more imperfectly reduced the ores arrive at the upper portion of the hearth, the more heat must be present in the hearth to keep the furnace working well. For this reason it is scarcely permissible to increase the ore to an amount fully corresponding to the quantity of heat carried in by the blast.

In proportion as the furnace is worked with a higher temperature of blast, there must occur a somewhat greater excess of heat in the hearth of the furnace. In addition to which, account must be taken of the concentration of heat, previously mentioned, which is a consequence of the more rapid combustion produced by the use of heated blast. If, therefore, the temperature of the blast is raised, there must be, in spite of the permissible increased burden, a somewhat higher temperature near the tuyeres. But the higher the temperature is at this point the more must silicon and earthy metals, such as calcium, magnesium and aluminium, be reduced from the charge, and the more impure (or poorer in iron) will the pig iron thus obtained be. But since the increased temperature of blast, as well as the increased amount of silicon in the pig iron, promotes the separation of carbon as graphite, the pig metal receives a greater inclination to become gray as the temperature of the blast is more elevated. Since also manganese belongs to the class of bodies requiring a very high temperature for their reduction, it will occur, in case the charge is manganiferous, that the heated blast will contribute to the production of a manganiferous pig iron. Finally, the removal of sulphur from iron is promoted by a high temperature, and passes as calcium sulphid into the cinder. Therefore, the hotter the blast is when used, the freer from sulphur will the pig iron be; the more so as from the saving in fuel produced by the heated blast, less of the sulphur contained in the fuel will be charged, which may be of some importance, especially in the case of coke rich in sulphur.

After these explanations, it would not be justifiable to entirely deny, as is sometimes done, the influence of the hot blast on the character of the pig iron. But, on the other hand, the influence in question is more commonly too highly estimated; so that in some localities, from fear of a deterioration of the pig iron, the advantages of the hot blast and consequent economy of fuel and more easy regulation of the working of the furnace have been entirely renounced, although these advantages become perceptible at a degree of temperature of the blast at which the action on the quality of the pig iron is not to be reasonably assumed. For, although the amount of gas produced per weight-unit of the ore-burden is very soon perceptibly changed by the hot blast, still there is in the blast-furnace, if not an actual excess, at least such a richness of reducing gases present, that a small decrease in the amount of gas cannot possibly exert a perceptible influence on the quality of the pig iron. If, however, the temperature of the blast is very high, then indeed such considerable changes take place in the quantity of reducing gases, as also in the concentration of heat, that by the otherwise unaltered working of the furnace it cannot be expected to obtain a pig iron as poor in silicon as when using cold-blast and the same mixture of ores. If, on the contrary, it be desired to produce as nearly as possible the same quality of pig iron from two dissimilar charges, it will naturally follow that of the two the more basic charge will be able to stand a higher temperature than the more siliceous one.

XXXV. If it be assumed that the co-efficient of expansion of the air is 0.00367, and that with a temperature of blast increased to t°C the same number of charges are carried by the furnace, the volume of blast forced into the furnace must be $1+0.00367t$ times greater than with cold blast. If, therefore, hot blast is to be used, it becomes necessary to adopt more powerful blowing-engines. It will first of all be discussed, presupposing that an unlimited amount of blast is at disposal, whether the number of charges has been modified in one way or another by heating the blast.

In the preceding it has been indicated how the slightest consumption of coal in a blast-furnace is dependent on the number of charges, which under the given conditions preserve the equilibrium, so to speak, between the different zones, in such a manner that if from any cause this number of charges be perceptibly increased or diminished, the consumption of coal will in either case be greater: by a diminution in the number of charges, since a certain quantity of coal must be sacrificed to properly heat the lower portion of the furnace (the hearth), and also by an increase, as the reduction thus diminished in the upper portions of the furnace occasions a loss of coal. Since it has also been shown that the reduction is impaired by heating the blast, on account of the diminution in the quantity of the reducing gases, it is evident that increasing the number of charges and heating the blast must exert an unfavorable influence upon it in this respect. It consequently follows that in order to preserve so far as possible a uniformity in the quality of the pig iron, it becomes necessary to diminish the number of charges in proportion as the blast passes into the furnace at a more elevated temperature. It must not be supposed from this that the number of charges is diminished in such a proportion as to produce the same quantity of pig iron in any unit of time, since the ability of carrying a greater burden of ore due to the heated blast may somewhat increase the production of pig iron, although not to the same degree as if the number of charges remained unaltered.

In order to more clearly explain the views just stated, attention shall once more be drawn to the fact how we have started with the assumption that a definite number of charges is the most serviceable in a blast-furnace working with cold-blast to produce the quality of pig iron desired. If this is not the case, and it becomes necessary, when using cold-blast, to be satisfied with a less number of charges, for some particular reason, it is evident that the number of them, when using a highly-heated blast, is not only to be left unchanged, but under some circumstances that an increased number can be useful. These peculiar circumstances may be: such a refractory mixture of ores and fluxes that, when blowing with cold-blast, it is scarcely possible to keep the tuyeres clear; or the existence of too weak a blowing-engine, which is, however, rendered more effective by the introduction of heated blast.

Finally, some examples of working results, taken from *Jern-Kontoret's Annaler*, are here reproduced, which have been attained by the use of hot-blast in various Swedish blast-furnaces.

In five blast-furnaces of the Norberg mining district, which had an average capacity of 146 tons* (132 to 164), the average results given in the row 1 were obtained in 1854, by the use of cold-blast, while those given in 2, are the results of five other furnaces of the same district, having an average capacity of 160 tons, and were worked with a blast heated to 160° to 200° C.

	Consumption of Coal, per cwt Pig iron.	Pig Iron produced from the charge.	Production of Pig Iron in 24 hours.	Amount of Fuel consumed.
1.	2.20 tons.	33.2 p. c.	102.8 cwt.	246.2 tons.
2.	1.75 "	40.4 "	131.5 "	230.1 "

From these figures it appears that in these small blast-furnaces of the Norberg district, by heating the blast to 160° to 200° C., and by a slight increase of the capacity, there has been 24.5 p. c. fuel saved, and an increased production of 28 p. c. While on the other hand the same increase of capacity has diminished the amount of coal consumed (i. e. diminished the number of charges) 5.7 p. c.

The seven blast-furnaces in the Diocese of Nora, which began to use hot-blast in 1851, whose temperature is not, however, given, showed an average decreased consumption of coal of 22.8 p. c., compared with the four furnaces of the same Diocese, using cold-blast.

XXXVI. It has already been shown in the preceding discussion, that in proportion as the blast is hotter, the pig iron produced will contain more silicon and earthy metals, as well as manganese, if the latter be contained in the burden. As the earthy metals usually occur in very small quantities in the pig iron, compared to the silicon, and that also the amount of manganese in the charge is rarely larger than is desired in the pig metal; and if, too, the influence of the hot-blast on the manner of occurence of carbon in the pig iron is left out of account, then there is every reason for the assertion that, to attain as great a saving in coal as possible, the blast should generally be as high as appears permissible with respect to the amount of silicon wished for in the pig iron.

It is assumed to be a well-known fact, that the amount of silicon in the pig iron depends not only on the temperature to which the blast is heated, but also on the quantity of silica present in the charge. That consequently, in order to produce a certain quality of pig iron, the blast can be more highly heated in proportion as the charge is more basic (contains less silica).

XXXVII. From the principle last laid down it follows that in the production of Bessemer pig with charcoal it must be advantageous, to blow with a much higher temperature of blast than has hitherto been the case. Since the pig iron will thus become hotter, although in consequence of the increased amount of graphite it will be more viscous and consequently more inclined to cool, and consequently will contain more silicon and manganese, which is of great importance in using this quality of pig. Since silicon and manganese contribute more than any other bodies to increase the temperature in the Bessemer process.

* The translator is uncertain whether the author means the Swedish ton equal to 5.1 cu. ft., or the Prussian ton equal to 7.75 cu. ft., or the Austrian ton equal to 11.2 cu. ft. F. P.

(TO BE CONTINUED.)

THE COAL TRADE.

NEW YORK, December 20, 1872.

Business is quiet, of course, that being the characteristic of the month. But it is not remarkably so, and city dealers are looking forward to a good winter. There seems to be no reason for a fall of prices, and the present rates will probably be sustained during the coming month without much change. The Pennsylvania Company advance their prices to-day ten cents a ton, which will have its effect in sustaining the market. That company is as usual full of orders. The next auction will take place on Friday, Christmas occurring on Wednesday.

The Lehigh Valley Railroad company gives notice that from January 1, it will settle for coal lost *en route* over its line at the current monthly wholesale rates issued by the Board of Trade at New York and Philadelphia, deducting from the circular price of coal free on board, the shipping expenses.

The average price of coal in Schuylkill County is found to be $2 29 for December.

The effort of the Reading road to have all the Schuylkill coal put into a pool, and sold under its direction, has not succeeded. The road will control the sales of collieries, whose yield amounts, we are informed, to about 2,500,000 tons; but other hard coal collieries representing 1,800,000 tons, together with the collieries of Lykens Valley and Shamokin producing 1,000,000—1,200,000 tons of free burning red ash coal, have declined to enter into the arrangement. The Reading road will therefore direct the sale of about five-elevenths of the coal from that district.

In the soft coal trade, also, the week presents no unusual features. Prices are still about $7.25 at New York, and the Consolidated Company quote $4.75 for coal at Baltimore. That company has had some trouble in getting coal forward, from a peculiar cause. The Clearfield District (Western Pennsylvania) labor troubles continue. The men will not withdraw their demands, and the masters will not yield, believing that the strike is the result of one of those pieces of management by which a few malcontents so often lead willing workers into idleness. A large proportion of the workmen are reported to be ready and anxious to resume on the old terms, but are restrained by fear. At the same time the horse disease is appearing in some of the collieries which have escaped labor complications, so that between the two sources of disturbance the product of the district is seriously lessened. It is from this region that the Pennsylvania Railroad draws its coal supply, and being compelled to turn to the Maryland mines in the emergency, it has seized upon the Consolidated Company's trains *vi et armis*, and hauled them off to supply its stations. That makes northern deliveries rather short for a time, but the annoyance will soon pass by. A force of mine police is organizing in the Clearfield region, the ranks being already pretty well filled up. This force will be commissioned by the Governor, and when it gets into operation those miners who are disposed to accept the masters' terms will be able to work without hindrance. This will be a great relief, though there will be a short supply for some time to come, both on account of low stocks to be replenished and some mines closed for lack of transportation. The *Iron World* of Pittsburgh says that prices are firm, with no prospect of lower rates. Coal $4.50@4.75, and Coke $4.50 on cars. Castle Shannon 9½ cents per bushel on platform.

Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending December 14, 1872, compared with the week ending Dec. 16, 1871.

COMPANIES.	1871. WEEK.	1871. TOTAL.	1872. WEEK.	1872. TOTAL.
*Phila & Reading R.R†	....	5 265,341	....	5,442,919
*Schuylkill Canal	....	1,010,171	....	899,190
*Lehigh Valley R. R.	....	2 410,274	....	3,0 9 395
Lehigh & Sus. R. R.	31 475	1,767,563	34,830	1,66 ,301
Lehigh Canal	....	740,733	....	767 0 4
Syracuse North	9,931	55 ,365	13 ,72	7 3,287
" South	62 319	1,767,9 8	40 412	1,907,470
Penn. Coal Co., rail	18,947	717,94	23,561	1,176,255
" " canal	....	14,962	....	6,241
Del. & Hud. Canal Co.	....	9 1 ,5 5	....	1, 91,041
" " East	6,891	3 4,0 2	11,916	53 ,9 7
" " West	203	11 ,6 8	8,831	4 8,1 6
" " South	7,23	33 ,5 9	7, 17	370,751
Shamokin	9,768	614,8 4	6,5 7	58 ,07
Trevorton	....	....	....	....
Lykens Valley Coal Co.	....	11,0 7	....	2,055
Wyoming North	....	....	....	....
Wyoming South	....	....	....	....
P. N. Y. C. & R. R. Co.	....	104,967	....	5 0,93
Williamstown Co'y	....	....	....	....
Big Lick Col	....	142,455	....	10,591
Total	137,704	15,777,2 6	146,6 6	19,4 0,6 3
1870	....	....	137 704	15 777,1 5
Increase	..	....	8,9 2	3,722,347
Decrease	....	....	....	....

* These figures are for the week and fiscal period ending Nov. 30

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1871 and 1872.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Dec. 14, 1872, compared with week ending Dec. 16, 1871.

COMPANIES.	1871. Week.	1871. Year.	1872. Week.	1872. Year.
C. & O. Canal	..	553,420	....	612,537
B. & O. R. R.	22,179	1,191,001	15,791	1,211 912
Penn. S. Line	4,853	.....	3 071	15,519
H. & B. T. R. R.	....	293 843	7,747	292,703
*Harrisburg & D.	....	511,812	....	454,331
*L. V. R. R.	....	366,096	....	27,060
P. & N.Y.C. & R. Co.	....	... ..	....	537 192
Cumberl'd Branch Canal	....	194,253	....	203 015
" Railroad	1,586	70,802	880	26 070
Total	29,618	3,290,227	27,496	3,181,242
	27,496	3,181,242		
Decrease	2,122	98,985		
Increase				

Penn. and P. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending December 14, 1872.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	5,974	10	12,420	04
" Lack. & B. R. R.	1 0.9	10	2 452	10
" Pleasant Valley R. R.	3,058	08	5,656	00
" Sul. & Erie R. R.	1,164	04	2 040	17
Total	11,224	19	23,569	17
Same time last year	9,464	06	20,061	02
Increase	1,760	13	2,508	15
Decrease				
Distributed:				
To Lehigh Valley R. R.	1,291	08	2,935	10
To Lack. & B. R. R.	29	13	46	15
To S. Central R. R	2 658	11	4,579	11
To Ithaca & A. R. R.	1,026	10	2,438	02
To Erie R. W. Pockets for ship'm't.	2 871	17	5 073	11
To individuals on line of road	1,366	14	2,366	15
To points at & above Coxton for use of Co.	722	08	1,424	02
To points between Waverley and Elmira	1,357	18	3,075	11
Total	11,224	19	24,569	17
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	5 124	06	9,678	10
Shipped south from Towanda	44	12	54	12
Northern Central R. R.	....			
Total	5,168	18	9, 733	02
Same time last year	6,669	01		
Increase	.....			
Decrease	1,500	03		
Distributed:				
To Erie Railway	4,528	11	8,939	17
To So. Central R. R	593	15	738	13
To Ithaca Valley R. R.	...			
Lehigh Valley, R. R.	44	12	44	12
To individuals on line of Railroad.	....		10	00
To points on line of road for use of Company	.....			
Total	5,168	18	9,733	02
Grand totals transported:				
Anthracite	11 224	19	22,569	17
Bituminous	5,168	18	9,733	02
Total	16 393	17	32,302	19
Same time last year	16,133	07	31,694	09
Increase	260	10	608	10
Decrease				

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Dec. 14, 1872.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt
Shipped North	13,3.2 05	773,787 09
Shipped South	40 412 03	1,967,470 06
Total	53 734 08	2,740,757 15
For the Corresponding time last Year:		
Shipped North	9,961 07	535,355 01
Shipped south	52,318 12	1,267,918 07
Total	62,279 19	1,803,273 08
Increase		937,489 07
Decrease	8,545 11	

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending December 14—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1872, tons cwt.	WEEK 1871, tons cwt.	YEAR 1872 tons cwt.	YEAR 1871, tons cwt.
Wyoming Region	31181 16	2 302 11	1412563 15	1251283 03
Upper Lehigh Region	4 15 14	3 27 04	196706 13	104696 2
Hazleton Region	644 08	510 15	24 80 18	2 2 92 16
Beaver Meadow Region	1467 02	2514 16	160197 16	79457 12
Mauch Chunk Region	2936 08	11152 01	403495 15	252.03 06
Freeoxow Region				
Mahanoy Region				
Totals	41448 06	39687 07	2419834 17	1886351 14
Increase	1760 19		56283 03	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	34819 16	34474 15	1e63300 14	1267353 13
Forwarded East of Mch Chunk by Canal		97 07	428605 15	420246 13
Delivered at and above Mauch Chunk	1303 06	1292 16	60943 10	61635 01
L. V. R. R at Packer'n		267 01	14460 05	12679 02
Delivered to L. & B. R. R. at Plymouth Bridge	850 18	28 5 08	222485 13	102,931 03
Totals				
Of the above there was transported on acc't of L. C. & N. Co.	6720 14	13488 15	6 3704 03	311566 03
W. B. C. & L. Co.	19963 10	16401 19	94,267 04	8389.0 04
Tota's	26684 04	29855 14	1566171 03	116.516 07
Increase			365654 16	
Decrease	3171 10			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Dec. 14, 1872.

BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	29,760	15
" Port Carbon	8,428	04
" Pottsville	3,203	04
" Schuylkill Haven	14,060	04
" Pine Grove	5 002	16
" Tamaqua	9,670	13
" Harrisburg		
" Dauphin	1,730	19
Total	68,843	13

FOR SHIPMENT BY CANAL.

Passing Frackville Scales

" Mill Creek "

" Schuylkill Valley Scales

" Mt. Carbon "

" Cressona "

" Pine Grove "

" Tamaqua "

Total

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	375	13
" N. C. R. R passing Locust Gap	843	08
" " " Shamokin	4,436	06
" " " Herndon	....	
Total	5,715	07

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,281	07
" Lebanon & Pine Grove Branch	878	11
Total	2,059	18

CONSUMED ON LATERALS.

From Frackville Scales	451	10
" Mill Creek "	773	01
" Schuylkill Valley Scales	968	06
" Mt. Carbon "	1,589	00
" Cressona "	453	17
" Pine Grove "	80	01
" Tamaqua "	426	07
Total	4,712	04

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	3,422	19
" " Cat. & Wpt. " Sent West	64	16
" " Rupert, Cat. & Wpt Br.	20	18
" " Allentown, E. Penn'a br.	46	15
" " Alburtis, " "	....	
" " Oreland, G. & N. Br.	1,086	13
" " Connecting R. R.	....	
" " Willow Street R. R.	500	03
Total	5,236	06

BITUMINOUS.

From Harrisburg	5,040	11
" Connecting R. R., G. & N. Br.		
" Junction R. R.	80	00
Total	5,080	11

COAL FOR COMPANY'S USE.

Anthracite	7,646	13
Bituminous	157	18
Total	7,804	11

RECAPITULATION.

	Total for Week.	Corresp'g week last year	Increase and Decrease.
Passing over Main Line and Leh. Val Branch	68,843 12	69,627 13	d 784 01
For Shipment by Canal		36 14	d 36 14
Shipped Westward via Northern Central R. R.	5,715 07	5,202 15	i 512 12
Shipped West or South from Pine Grove	2,059 18	2,9 8 10	d 899 11
Consumed on Laterals	4,712 02	5,.51 10	i 960 12
Lehigh and Wyoming Coal	5,236 06	1,844 19	i 3,391 07
Total Anthracite paying freig't	86,567 06	83,224 04	i 3,343 04
Bituminous	5,090 11	9,177 01	d 4,086 10
Total of all kinds paying freig't	91,657 16	92 399 05	d 741 09
Coal for Company's use	7,804 11	6,662 01	i 1,142 10
Total Tonnage for Week	99,462 18	99,06. 03	i 401 04
Previously this year		144,9.3 04	d 38,244 05
Total to date	193,141 01	224,984 06	d 34,843 01

SHIPPED BY CANAL.

From Schuylkill Haven	193 00	1,935 08	d 1,737 08
" Port Clinton			
Total Tonnage per Week	194 00	1,935 08	d 1,737 08
Previously this year	6,396 00	10,3.8 12	d 3,982 12
Total to date	6,594 00	12,334 00	d 5,740 00

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, December 7, 1872.

	Tons.	Cwt.
From Schuylkill Haven	6,0 1	00
" Port Clinton	1,8	00
Total for week	6,396	00
Previously this year		
Total	6,396	00
To same time last year	10,.18	12

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, December 14, 1872.

	WEEK.	SEASON.
North	53,835 10	2,466 648 14
South	7,217 01	370,7.1 03
Total 1872	61,052 11	2,837,299 17
Corresponding time in 1871:		
North	41,610 19	1,884 691 17
South	7 231 04	3.6,5.9 02
Total	49,84. 03	1,911,.81 19
Increase North		
Decrease North		
Increase South		
Decrease South		
Total increase 1872	11,210 08	916,017 18
Decrease		

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Dec. 14, 1872, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	11,204 07	21,412 13
" Hazleton	23,687 14	63,011 04
" Upper Lehigh	28 14	194 6
" Beaver Meadow	11,834 01	22,424 01
" Mahanoy	8,691 15	17,879 04
" Mauch Chunk	11 04	50 10
Total	61,407 13	127,956 12
Same time last year	63,695 01	150,323 17
Increase		
Decrease	287 10	22,467 05
Forwarded East from Mauch Chunk by rail	54,953 01	107,077 14
Same time last year	48,790 03	133,670 14
Increase		
Decrease	3,938 02	26,593 00

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	52,685 16	101,427 12
do East for use L. V. R. R.	1,291 11	2,650 04
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,171 04	3,277 16
To P. & N. Y. R. R.	5,974 10	12,470 04
To M. C. R. R., at Mount Carmel		553 19
To D. H & W. R. R.	699 13	1,668 08
To L. & S. R. R. at Packerton for rail	261 07	452 07
Delivered at M'h Chunk	96 06	163 06
Delivered on line of road above Mauch Chunk	477 02	779 06
To L. S. & R. R., at Penn Hav., for railroad	1,835 10	1,835 10
Do for canal		
To Lehigh Canal Mauch Chunk		5 00
To Catawissa Railroad		
Total	65,407 13	127,956 12

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Dec. 14, and during the year 1872, compared with the corresponding period of 1871.

WEEK.

	C. & O. C'l Tons. Cwt.	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1872	—	15,790 13	3,077 15	18,868 08
1871	—	22,178 11	....	22,178 11
Increase			3,077 15	
Decrease	—	6,387 18		3,310 03

YEAR.

1872	612,536 18	1,211,912 13	15,819 02	1,840,268 13
1871	354,400 02	1,191,000 15	....	1,544,420 17
Increase	....	20,911 18	15,819 02	
Decrease	40,863 04	....	....	4,152 04

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1872	—	879 11	879 11
1871	—	1,585 16	1,585 16
Increase	—	....	708 05
Decrease	....	778 05	....

YEAR.

1872	201,617 16	28,067 16	229,685 12
1871	194,283 07	10,801 11	205,084 18
Increase	9,364 09		
Decrease		44,131 15	35,397 06

Lehigh Coal and Navigation Company.

Report of Coal transported over the Lehigh Canal and L. & S. Div of Central Railroad of New Jersey for the week ending Dec. 14, 1872, and for the year 1872.

	WEEK.	YEAR.
Forwarded East of M'ch Chunk by Rail	34,819 16	1,6[illegible]9,200 14
Delivered at and above do.,	1,303 06	60,943 10
Forwarded East of do., by Canal	.....	707 094 04
	36,679 19	2, 91,338 08
Corresponding period last year—		
Forwarded East of M. Chunk by Rail	34,474 13	1,267,858 13
Delivered at and above do.,	1,092 16	67,835 01
Forwarded East of do., by Canal	.....	740,636 01
	35,567 11	2,076 324 05
Increase on Railroad	.....	369,049 08
Decrease " "	314 09	
Increase on Canal	.....	26,360 16
Decrease " "	5,870 09	
Of the above there was transported on account of—		
Lehigh Coal Nav. Co	6,720 14	865,591 08
Wilkesbarre Coal & Iron Co	19,963 10	940,267 00
	26,684 04	1,805,775 03
Corresponding period last year—		
Lehigh Coal & Nav. Co	13,453 13	691,345 09
Wilkesbarre Coal & Iron Co	15,401 19	538,950 04
	28,855 11	1,443 295 12
Increase	.....	362,479 15
Decrease	2,171 10	.....

Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co., for the week ending Dec. 14, 1872.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal, ..	....	1,794,041
By Railroad, East	11,916	530,927
" " West	8,561	416,736
" " South	7,217	370,751
Total Tons	27,294	2,711,855

For the same period last year.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	....	491,825
By Railroad, East,	6,800	284,042
" " West	2 3	312 188
" " South	7,231	326,800
Total Tons	14,284	1,764,695
Increase	947,160	

Lehigh Canal Coal Trade.

Shipped for the week ending December 6, 1872.

	Week. Tons. Cwt.	Week. Tons. Cwt.
Total from Mauch Chunk Region	199 14	220 694 05
" " Hazardville "	4 5 00	11,480 09
" " Beaver Meadow "	.....	149,399 11
" " Mahanoy "	93 00	13,3 5 12
" " Hazleton "	....	22[illegible],907 19
" " Upper Lehigh "	....	29,847 12
" " Wyoming "	....	92,169 15
" " do do Hazardville	.....	2,769 01
Total	746 14	787,094 04
Corresponding week last year	97 07	740,733 08
Increase	649 07	26,360 16
Decrease	.....	

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending December 14, 1872.

	1872. WEEK.	1872. YEAR.	1871. WEEK.	1871. YEAR
By Railway	23,860 13	1,176,224 19	16,946 19	747 945 15
" Canal	....	6,250 18	....	13,962 04
Total	23,860 13	1,182,475 17	16,946 19	761,907 19
Increase 1872.	420,467 18			

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the week ending December 14, 1872.

	Tons.	Cwt.	
East	31 00		
West	6,556 07		
			6,587 07
Same time last year			9,767 19
Increase			.....
Decrease			3,180 12
Total amount shipped to date			550,071 09
Same time last year			614,823 17
Increase			.....
Decrease			64,752 08

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. December 20.		AT PHILADELPHIA. December 20.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	5 25	4 75	— —	— —
Stove	5 50	5 00	— —	— —
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 25	— —	— —	— —
Broken	4 60	— —	— —	— —
Egg	4 60	— —	— —	— —
Stove	4 25	— —	— —	— —
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Honey Brook, Le'h W. A.	4 00@5 00		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Creek	— —@— —		— —	— —
Sugar Loaf	— —@— —		— —	— —
Old Comp'y's	4 00@5 15		— —	— —
Room Run	4 00@4 50		— —	— —
McNeal	— —		— —	— —
Girardville	— —		— —	— —
Hill & Harris	— —		5 10@6 00	—
Shamokin	— —		— —	— —
Lykens Valley	— —		— —	— —
Broad Top	— —		— —	— —
McMichael	— —		3 25@4 25	— —
Henry Clay	— —		— —	— —
Powelton	— —		— —	— —

Company Coals.

December, 1872.

	L.	Str.	Ora.	Ke.	Sto.	Chest
*Scranton at E. Port	3 45	3 45	3 65	3 70	4 00	3 80
*Pittston at Newburg	3 80	3 10	3 80	3 80	4 00	3 80
*Lackawana at Weehawken	4 01	4 10	4 10	4 30	4 00	3 60
Wilk'b're at Hoboken	3 60	3 65	3 65	3 65	4 00	4 10
Old Co. Lehigh at Pt. John'n	5 25	—	4 50	4 60	4 60	4 10
Lehigh at Eliz. Port	5 00	—	4 60	4 60	4 80	4 00

For freights to different points see "Freights" To contractors only.

Prices at Baltimore—December, 1872.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 35@5 60
Pittston and Plymouth, do	5 25@5 50
Shamokin Red or White Ash, do	5 50@5 75
Lykens Valley Red Ash, do	5 25@5 50
Zerbe Valley	
Trevorton	
By retail, all kinds per ton of 2,240 lbs	7 25@7 50
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	@4 75
Fairmount and Clarksburg gas f. o. b. at L. Point	4 00
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Consolidation Coal Co.'s on board N. Y.	
Maryland Co'l Co	"

Prices at Georgetown, D.C., and Alexandria, Va.

December, 1872.

George's Creek and Cumberland f. o. b. for shipping $4 37@4 50 [nominally.

Prices at Havre de Grace, Md.

December, 1872.

Wilkesbarre and other White Ash for Cargoes	$ @4 75
Lykens Valley	@5 75
Shamokin Red or White Ash	5 00

Bituminous Coals (Cumberland).

Georgetown, F.o.b	$4.25
Baltimore	4.65
New York	6.60

Prices of Foreign Coals.

December, 1872.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

	Nominal.
Liverpool Gas Coking	
" " Cannel	18 00@18 50
" House	22 00@23 00
" Orrel	17 00@18 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$21 00@22 00
" Cannel,	23 00@25 00
Per ton 2,000 lbs. delivered.	

Foreign and Provincial Freights,

December 1872.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.	
Sydney	$6 65
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00
TO BOSTON.	
Sydney	3 50
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 50
Little Glace Bay	3 50

Prices of Gas Coals.

December, 1872.

PROVISCIAL.

Corrected weekly by Louis J. Beltoni, Jr., 41-43 Pine st., N. Y

	Coarse.	Block.
Block House	$1 00	$1 00
Gowrie	1 75	— 80

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal,
Pictou	$2 25	1 25
Sydney	2 25	— 80
Lingan	1 75	— 80
Caledonia	1 75	— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quo. Currency.
Westmoreland	$7 10 @— —
Fairmount Gas Coal Co. of N. Y.	7 00 @— —
Despard Coal Co.	7 00 @— —
Penn.	7 10 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —
Redbank Cannel, Penn.	— — @— —
AT PHILADELPHIA.	
Westmoreland	7 00 @— —

Freights.—December, 1872.

Cumberland. TO EASTERN PORTS.	From Georgetown.	From Baltimore.	Anthracite. From Philad'a.	From Elizabethport, Port Johnson, and Hoboken.	From Newburgh.	From Rondout.
Amesbury						
Bangor						
Bath						
Boston	3 10	3 75		3 00		
Bridgeport	2 .0	2 75		1 00		
Bristol				1 60		
Cohasset Narrows	2 25					
Derby				1 25		
Dighton	3 00					
East Cambridge				1 50		1 [illegible]
Fall River	2 75	2 75		1 40		
Hackensack						
Hartford				1 00		
Hoboken	2 10			80		
Jersey City	2 1.			80		
Lynn						
Middletown				1 00		
Mystic				1 10		
New Bedford	3 00	3 00		1 40		
Newburyport	3 10			1 50		
New Haven	2 75	2 75		1 00		
New London	2 75	2 75		1 30		
Newport	3 [illegible]			1 40		
New York	2 25	2 25		80		
Norwalk	2 50	2 75		1 00		
Norwich				1 00		
Pawtucket				1 00		
Portland	3 25	3 75		3 00		
Portsmouth, N. H		4 00		3 [illegible]		
Providence	2 75	2 75		1 40		
Rockport						
Saco						
Sag Harbor				1 20		
Salem	2 70			1 00		
Stamford				1 00		
Stonington				1 30		
Taunton						
Warren				1 40		
TO RIVER PORTS						
Albany						
Catskill						
Cockseckie						
Cozyman's						
Cold Spring	2 80					
Fishkill						
Haverstraw						
Hudson	3 25					
New York						
Nyack	2 [illegible]					
Poughkeepsie	2 80					
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy	3 00					
West Point						
Yonkers						

St. Thomas	$5 00	Gold.
Martinique	6 00	"
Demerara	6 50	"
New Orleans	6 00	"
Mobile	6 00	"

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption (rate 85 less 50c. drawback)	$1 30
For reshipment	1 75
MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 60
C. R. R., N. J., Phillipsburgh to Elizabethport	0 50
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$ 90
MAUCH CHUNK TO PORT JOHNSON.	
L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 60
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	0 50
Shipping expenses	25
Wharfage	
Total	$1 10
TO HOBOKEN	
L. V. R. R., Mauch Chunk to Phillipsburgh	60
Morris & Essex R. R. Phillipsburgh to Hoboken	0 90
Shipping expenses	25
Wharfage	
Total	$1 [illegible]

TO SOUTH AMBOY.	
L. V. R. R.	65
P. & H. R. R. } C. & A. R. R. }	90
Shipping Expenses	25
Total	$1 80

PENN HAVEN TO ELIZABETHPORT.	
L. V. R R. Penn Haven to Philipsburgh	0 70
C. Rail. of N. J. Philipsburgh to Elizabethport	0 90
Shipping expenses	25
Wharfage	10
Total	$1 90

MARKET REVIEW.

NEW YORK, Dec. 19, 1872.

IRON—Scotch Pig is quiet, and we have no sales to report. Advices from England report an advance of 10a20 shillings, which has caused holders here to advance their rates, while buyers hold off expecting the rise to be but temporary. Little business, however, is now looked for for some time to come. American Pig is unsettled, and prices are entirely nominal; No. 1, we understand, is freely offered at $45, No. 2 $43, while Gray Forge may be had for $38a40; the only sale we hear of is 200 tons No. 1 on terms not made public. English Rails are quiet and without business at $70a74 gold for new, and $51 currency for old. Scrap is also quiet, and prices are somewhat nominal at $45 from yard, and $40a42 from dock; 200 tons Wrought sold on terms not made public. Refined Bar from store continues steady at our quotations, with a disposition rather to advance than recede. Russian Sheet is held more firmly in consequence of the reported loss, in the North Sea, of the Bark Sharpsburg with 400 packs on board, for Boston—150 packs sound sold at15¼a16 cents gold.

A late Liverpool paper says:—Wolverhampton accounts report the Iron Trade still very quiet. Prices both of Pig and finished Iron are slightly easier, but any serious fall is prevented by the great cost of production. Pigs are £7 for best brands of all mine, and proportionate rates for the commoner makes. Bars, although quoted £12 per ton by the leading firms, are selling as low as £10, £10 10s. per ton at the second class establishments. Sheets are offering at £13 for singles—a reduction of £7 on the rates prevailing a few months ago.

COPPER—New Sheathing is steady at 43 cents, and Bolts and Braziers. Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts 32, net cash. Ingot is in better demand, and prices are about one cent per pound higher, in sympathy with the rise in England. Cables are at hand from London quoting Colli Bars £84 10s. and Best Selected English £92a£92 10s. Sales have been made of 50,000 lbs. Lake, part for immediate, and part for January and February delivery, at 31a32 cents; 100,000 lbs. do., 32, cash; and 200,000 lbs. do., for future delivery 33, closing at 32 asked for cash lots.

STEEL—The market is poorly supplied, and very firm at our quotations, rather over than under.

SPELTER—There is very little inquiry; 25 tons Silesian sold at 6¾ cents gold.

TIN—Pig has been favorably affected by telegrams from England quoting an advance there—Straits now £138 in London. There is some disposition here to buy and less to sell, with an advance on all kinds of 1a1½ cents per lb Sales have been made of several parcels of Straits in all about 12a13,000 slabs, commencing at 29½ cents and closing at 31; English 31 and Banca 37, all gold. The rumors of large transactions noted in our last have not been confirmed. There continues a pretty active demand for Plates, and the market is very firm at the recent advance; Liverpool Cables quote fair brands Charcoal Tin 38-4 s. Sales have been made of 250 bxs. I X Charcoal Tin here, and 500 do. for January and February delivery, at $10.25; 500 do., deliverable in ten days, $11; 250 do. I. C. Coke, $9.12½; 1000a1500 do. on spot, and 1500 do. for forward delivery, $9.50a9 75; and 500 do. B. C. Coke Terne, part to arrive, $8.50, 60 days, all gold.

ZINC—Sheet is firm and steady at previous figures—100 casks Mosselmann sold from agents' hands at 9½ cents less 4 per cent. gold,

PHILADELPHIA, Dec. 16, 1872—Edward Samuel, No. 332 Walnut street, reports as follows:

The past week has been noted for nothing but dullness in the Iron Market. In Pig Iron, there is so little inquiry that quotations are only nominal. Old Rails continue in full supply, without inquiry, and are offered at figures considerably below the cost of importation. Wrought Scrap Iron has been in more demand, but buyers are only in the market for small lots, preferring to carry no stock over into the coming new year. In Merchant bars, the nominal mill price is 4½ cents per lb. base, but many mills that are slack of work, offer at lower figures, generally without finding purchasers. After the New Year, the market generally bids to be more firm, under the influence of expected orders. Below are the closing prices of standard qualities: American No. 1 Foundry Pig, at Furnace, $45a50; No. 2, $43a46; No. 3 Forge, $35a40; No. 4 White and Mottled, $32a34; Scotch Pig, Cargo lots for shipment, 47a48; Old Rails, D. H., for shipment here, $48a49 gold; on the spot and for arrival, 47a47; No. 1 Wrought Scrap, ex ship, 45a46 Currency; for shipment here, 46a47; American Refined Bar, Mill price, 4½ cents; Common $8 50a90; Rails, at Mill, $84a85; English Rails, ex ship, N. Y., $72½a74 Gold.

METALS.

NEW YORK, December 19, 1872.

IRON.—Duty: Bars, 1 to 1½ cents ₩ lb; Railroad, 70 cents ₩100 lbs.: Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₩ ton	— —@— —
Gartsherrie	— —@— —
Glengarnock	48 00@— —
Eglinton	44 00@45 00
Pig, American, No. 1	45 00@00 00
Pig, American, No. 2	43 00@00 00
Pig, American, Forge	35 00@40 —
Bar Refined, English and American	— —@120 00
Bar Swedes, assorted sizes gold	120 00@130 00
	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ⅜ & ⅝ 2 sq. & 6 to 12 x ⅜ & ⅝	145 00@155 00
Bar, Refined, ⅜ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	— —@105 00
Bar, R fined, 1⅛ to 6 by ¼	110 00@— —
Bar, Refined 2½ to 2⅝ round 1 & 1⅛ by ¼ & 5:16	112 50@— —
Large Rounds	112 50@125 00
Scroll	120 00@150 00
Ovals and half-round	130 00@150 00
Squares	— —@124 50
Horse Shoe	117 00@127 50
Rods, ⅝ to 3-16 inch	110 00@152 50
Hoop	127 50@172 50
Nailrod	@ 9
Sheet, Russia, as to assortment (gold)	15½@ 16
Sheet, Singles, D. and T. Common	—6¾@— 7
Sheet, D. and T. Charcoal	—7¼@— 8½
Sheet, Galv'd, list 10 per cent. discount	—@— —
Rails, English (gold), ₩ ton	70 00@ 72 00
Rails, American, at Works in Pennsylvania, currency	00 00@ 00 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	—@— 43
Copper Bolts	—@— 45
Copper Braziers, 14oz. and over	—@— 45
Copper Nails	—@— 45
Copper, Old Sheathing, &c. mixed lots	26@— 28
Copper, Old, for chemical purposes, 14@16 oz.	—@— —
Copper, American ingot	31¼@— 32
Copper English Pig	28@— 28½
Yellow Metal, New Sheathing & Bronze	—@— 27
Yellow Metal Bolts	—@— 32
Yellow Metal Nails	27@— 30

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb; Pipe and Sheet, 2½ cents ₩ lb.

Galena, ₩ 100 lbs	$— —@— —
Spanish (gold)	6 50@6 62½
German, do.	6 50@6 62½
English do.	6 6¼@7 00
Bar (not)	9 25@— —
Pipe (not)	— —@11 00
Sheet	— —@11 00

Colwell, Shaw & Willard Tin-Lined Lead Pipe 16½ cts. ₩ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under, 2 4 cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. Store prices.

English Cast (2d and 1st quality) ₩ lb	— 18@— 22
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 11@— 16
English Machinery	— 11½@— 14
English German (2d an 1st quality)	— 11½@— 12
American Blister "Black Diamond"	— —@— 11½
American, Cast, Tool do.	— —@— 17
American, Spring, do.	— —@— 11
American Machinery do.	— —@— 11½
American German, do.	— 9@— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 35. ad val.

	Gold ₩ lb.
Banca	37@—
Straits	31@—
English	—@31

PLATES. Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₩ box	$12 75@11 00	$12 50@13 00
I. C. Coke	9 50@ 9 75	11 00@11 50
Coke Terne	8 50@ 9 00	9 75@10 25
Charcoal Terne	9 75@10 00	11 00@11 75

SPELTER.—Duty: In Pigs, Slabs & Plates.

Plates, foreign (gold) p. 100 lb.	$1.50 p. 100 lb
Plates, Domestic p lb.	6 62½@ 6 75
	6½@— 10¼

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per Sheet per lb.—10¼@10½

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Dec. 19, 1872.

The following report from the San Francisco Stock Board is dated the 17th inst. With the exception of an advance in Raymond & Ely, and Meadow Valley, the list has considerably advanced.

		Dec. 16.
Savage	—	73
Crown Point	—	102
Yellow Jacket	—	57
Kentuck	—	140
Utah or Potosi	—	53
Gould & Curry	—	180
Bolcher "New Lode"	—	1.4
Imperial	—	1⅞
Raymond & Ely	—	20
Meadow Valley	—	18½

WOOD ENGRAVING
EXECUTED AT THE OFFICE OF
The Engineering and Mining Journal.
27 PARK PLACE, NEW YORK CITY.

DROWN & CORLISS,
ANALYTICAL CHEMISTS
AND
CONSULTING METALLURGISTS.
1123 GIRARD STREET,
PHILADELPHIA.
THOMAS M. DROWN. GEORGE F. CORLISS.

ALEX. TRIPPEL, C. E., MINING ENGINEER AND METALLURGIST.
ISIDOR WALZ, Ph. D. ANALYTICAL AND CONSULTING CHEMIST.
No. 18 EXCHANGE PLACE, NEW YORK.

W. B. COGSWELL,
Civil & Mechanical Engineer.
SPECIALITY:
Blast Furnace Construction.
P. O. Address
Franklin Iron Works,
Oneida County,
Nov. 19:1y N. Y.

JOHN J. ENDRES,
Mining and Civil Engineer,
MANUFACTURER OF MACHINERY FOR MINING AND SMELTING PURPOSES.
SPECIALITY:
Patent Ore and Coal Crushing and Washing Machines.
BUILDER OF IMPROVED COKE OVENS AND MACHINERY FOR DISCHARGING THE SAME.
Office and Works:
SOUTH PITTSBURGH, PA.
Nov. 26:3m

P. H. VAN DER WEYDE, M. D.,
(Late Professor of the N. Y. Medical College, Mechanics, etc., at the Cooper Institute, and of Industrial Science at the Girard College, Philadelphia.)
Analytical & Consulting Chemist and Engineer
236 Duffield street, Brooklyn.
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Experts in Iron, Analytical Chemists,
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F. H. BOLLINS, 8 Church street, New York.
Oct. 1.1.year

Fires in Coal Mines.

MR. KNOWLES, proprietor of the Pendlebury colliery, lately gave an account of a fire in that mine, and the mode of extinguishing it, to the Manchester Geological Society.

He said that water was thrown upon the burning coal—three small fire-engines and a supply of 2 in. iron pipe, beside hose, being used for the purpose—and gradually, owing to the generation of steam, the fire was choked. He would suggest that at every colliery there should be a small fire engine, or at least a wagon, fitted with pumps, capable of being dispatched to any part of the workings at a moment's notice. The Ram's Mine, Pendlebury, was closed, in consequence of the fire in question, for ten days. Work was resumed, for the first time since its occurrence, on Monday. He estimated the loss which it had occasioned to the firm at about 1500*l.*

Some discussion followed, in which the chairman expressed his warm approval of the steps that were taken to extinguish the Pendlebury fire. His opinion at the time was that so large a fire could hardly be extinguished by water, an agent which he had known to fail often; but when he saw how vigorously the men were playing upon it by means of a powerful hand-engine, and the progress that had been made, he encouraged them to persevere. In 16 hours the fire had run up the brow about 60 yards, consuming the coal to a depth of 2 or 3 feet, and yet the men were keeping it well in check. He saw a second engine brought to the front, and finding that all was working satisfactorily, and feeling "knocked up," he ascended the shaft. He was of opinion that the men working the engines at such a fire should be relieved every ten minutes. The result showed how successfully a fire might be dealt with by the use of water. A larger one than this he had never seen extinguished by that agency. With less room to work in the men would not have been as successful as they were. He had known Gurney's plan of extinguishing fires in mines—that of pouring a stream of pure carbonic acid upon the flames—to fail in several instances in which it had been tried. His (the Chairman's) recommendation was that in dealing with fires water should in the first instance be used freely and promptly. If that was not done the fire should be shut off. In the event of that being found impracticable, there was no resource left but to flood the mine; but no mine should be flooded until it was clearly seen, by persons having a knowledge of the subject, that the fire could not be subdued in any other way.

Mr. Herbert Fletcher recommended that miners should be drilled periodically in the use of engines and hose.

Mr. T. Knowles, Ince, and other gentlemen addressed the meeting; and it was stated in the course of the discussion that Sinclair's *extincteurs* were of no use in mines, because the draught of air was too strong.

Kindling Fires by Gas.

A FEW months since, we had occasion to refer to the "Gas-Poker," so-called, patented in England, December 12, 1854, by GEORGE HENRY BACHHOFFER, "consisting of a hollow metallic tube, shaped like a common poker, the lower end being perforated with holes," attached to a gas-pipe by a flexible tube, and thrust into the fuel, and so on; and we then stated that our objection to this plan was that it is inapplicable to the kindling of the very kind of fuel for which we, in this country, most need such a device, namely, our hard American anthracites; and we stated that some experiments had been made by ourselves looking to the introduction of a sort of gas blow-pipe for this purpose. The use, in this combination, of a pair of ordinary bellows was an obvious device held in contemplation. Others, it would appear, however, have also been at work in the same direction, as is usually found to be the case when there is a distinct call for an invention to supply a special want. In such cases, it is extremely common to find that different inventors, at distant points sometimes throughout the world, are engaged upon the same problem and arrive at the same end. Thus, in this case, the following item was observed in a recent account of an "Exhibition of Domestic Economy," in Paris:—

"MM. E. D'Hallu and L. Derchen, ventilating contractors, exhibit a bellows for domestic use, in which a blow-pipe emits a blast of ordinary illuminating gas. The jet of gas directed on to a fire soon increases the combustion."

Curiously, however, just about the same time we happened, in searching for another subject, to light upon another English patent, a year or two subsequent to Bachhoffer's, that illustrates ludicrously the way in which so often "history repeats itself" in matters of invention. March 1, 1856, Paul Rapsey Hodge patented "Improvements in methods of lighting domestic fires.....Gas is compressed, by a pump or by other means, into a strong vessel, shaped like a pail, which may be readily carried from room to room. It is provided with a suitable tap, elastic tube and metallic nozzle, to be inserted among the coals for the purpose of igniting them. A bellows may be attached to the apparatus, or the mouth may be used to blow air into the fire along with the gas, separate suitable piping being provided for that purpose, which joins the gas pipe near the commencement of the nozzle-pipe."

It appears, therefore, that all these plans belong, by this time to the public, and any body who chooses can use them. Hodge's portable receiver, or pail, however, involves the appendage or provision of some kind of machinery for compression, which must necessarily be to some extent complex and expensive. It is obviously preferable that some plan should be perfected involving the application of the bellows, or other air-blast, to the gas under its usual pressure in the service-pipes; and we venture to hope that among our inventive readers some one may be found to pursue these experiments, which we are confident could be made, in case of complete practical success, to lead to a satisfactory emolument.—*Am. Gaslight Journal.*

Electro Tinning of Metals.

An English company has just put in operation at Birmingham a process for tinning metals, which is the invention of a London electrotyper. The deposited metal, of which tin is the principal ingredient, is of silvery whiteness, and will attach itself to all metals except zinc. The process is extremely simple, the white metal being merely deposited in its metallic form, from a solution, on a surface of articles exposed to the action of a galvanic battery. Prior to undergoing this galvanic treatment the article, if rough and uneven on the surface, is scoured with sand, and any rust or oxidation is afterwards removed by plunging the article in a bath of sulphuric acid and water. The presence of grease or other impurity would be equally fatal to the electrotype process of tinning as it would be in the case of depositing electro-silver. Therefore, on leaving the bath, containing diluted sulphuric acid, the objects operated upon are plunged into a lye of hot potash, which renders them chemically clean. They are next passed on to the plating vat, where the process is completed. This vat, or deposit bath, is externally of teak, coated with marine glue, which coat is internally protected by an inner sheathing of pine wood, merely to prevent the glue from being cut or injured by the points or angles of heavy goods plunged into the bath, and thus the bath is made perfectly water-tight. The new vats are similar in principle to an ordinary electro-plating vat, and similarly contain a solution of the metal to be deposited. At one end of the vat is a plate of the metal in connection with one of the poles of a galvanic battery, while over it are metal bars connected with the opposite pole. The articles to be plated are hung in the solution from the bars by means of copperwire. Immediately they are placed in the solution galvanic action takes place, and almost in a moment they receive a white metallic coating. Some time, however, has to elapse to allow the plating to become thicker. On their withdrawal from the vat the articles are of a dull white color, and have to be subjected to the action of a metallic brush moistened with a cleansing fluid. They are thereby rendered of a bright silvery appearance, and the process is complete. If additional brilliancy is required the articles may be burnished in the same manner as ordinary electro-plate. One of the chief advantages claimed for the new method is that it completely obviates the liability of iron and steel goods to rust; and another feature in its application will probably result from the fact that electro-plated goods can now be prepared to receive their coat of silver by a white undercoat of metal, which will prevent the disagreeable effect at present so apparent in these articles, produced by the yellow glint of the original copper deposit showing through the worn silver coating. The work is performed at present by means of Bunsen's batteries, but there are four large electro-magnet machines already on the premises. These will be worked by steam-power, and will be capable of turning out an enormous amount of work.

Primitive Uses of Flint.

THOSE who are not already somewhat versed in the science of archæology will be astonished to learn the infinite variety of uses to which the apparently stubborn and unmanageable rock called flint has been converted. We may, perhaps, doubt if, in the earliest ages, it was used for purposes of warfare, and we prefer to give our progenitors the benefit of that doubt, and to believe that there were "golden ages"—times of primitive piety and peace; and that it was only for the purposes of husbandry, and the chase, and domestic use, that they worked up the materials found in their plains and valleys. Thus, we find descriptions of celts, or axes for felling trees, or hewing canoes, hoes, threshing-machines—as now used in the East—or perhaps harrows, scrapers for preparing skins, arrows for birds or other "small deer," knives, gouges, saws, mullers, or pounding-stones, chisels, hammer-axes or picks, and polishing or grinding stones, of which there must have been great need; nor were the women of the period left destitute of their share of the stony spoil; for we find in Evan's "Ancient Stone Implements" descriptions and figures of rings, armlets, amulets, spindle-whorls, pestles, and, in the cave deposits, needles of bone, of admirable workmanship, which might have been, and probably were, drilled by flint-flakes.—*Popular Science Monthly.*

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The next meeting of the Institute will be held Tuesday, February 18, 1873, in Boston, Mass. Prof. T. STERRY HUNT, and Prof. W. H. PETTEE are the local Committee of Arrangements.

II. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

III. It is expected that the more important papers read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

IV. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

V. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.
1123 Girard street, Philadelphia, Pa.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
JOHN A. CHURCH, E. M.
Editors.

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WE publish on another page an article on the manufacture of artificial fuel by Mr. LOISEAU, who probably has had more experience in the matter than any other man in America. The subject is one of great importance. England manufactured in 1871 about 230,000 tons of "patent fuel," and aside from the value of the product, there is a secondary advantage, worth considering, in the use of a material which has hitherto been only a nuisance. This industry has reached a pretty wide extension on the Continent, and in Belgium and France piles of brick fuel may be seen at the railroad stations. In the Rhine region the mixing of clay with coal is an affair of constant occurrence. Many an American has opened his eyes on seeing a bushel or two of clay dumped with every cart load of coal, and carefully mixed in with it by the attendant coal heaver. But he is still more surprised to see his servant gravely empty a pail of water into his coal box together with the morning's supply of fuel. The coal is mostly slack, and the fires do not burn well if the coal is dry. In fact an anthracite-burning American can find a good deal to interest him in Westphalia and Rhineland.

PRESIDENT BARNARD of Columbia College, who is Chairman of the Committee on Group XIV., embracing instruments of precision in mechanics chemistry, etc., has issued a circular inviting contributions. He justly says that:

"No more favorable opportunity could be offered to skillful constructors of apparatus of any description, or to the originators of new and useful inventions, for securing a wide recognition of the merits of their work, or for bringing directly to the notice of the world the nature and value of their improvements, than will be presented in this Exposition. There can be no doubt that every deserving exhibitor will find ample compensation for the time and trouble it may cost him, not only in the honor which will attend successful competition, but in the substantial benefits which will result from the extension of the demand for the products of his industry."

Professor THURSTON, Chairman of the Committee on Group XIII., or machinery, says in his circular:

"The Exhibition will be visited by many hundreds of thousands of people, and it may be confidently expected that, in many cases, it will occur that manufacturers sending articles from the United States will find their home market so considerably enlarged, by favorable reports brought from Vienna, as to make the outlay a remunerative one, even were they to secure no orders from abroad. The proportion of American visitors at European International Exhibitions is always very large."

IF Americans would only accept and put in practice the lessons of the fires as they occur in such rapid succession, the art of house building would soon reach perfection in this country. The calamity at Boston has probably already affected the style of building in every part of the country, and one of its lessons was enforced in the most painful manner in the fire which occurred in the Fifth Avenue Hotel, New York, two weeks ago. When the danger was past and an examination was made into the amount of damage, one item presented itself which was horrible in the extreme. The bodies of twelve servant girls were found in two rooms. The fire had not begun in the attic in which they slept but had reached that part of the building by a spiral staircase from below, just as at Boston the fire gained its foothold by spreading rapidly through a building by way of the hoist.

These perpendicular communications are really the most dangerous elements in our houses, and their construction, in all cases where fire could threaten human life, as in hotels, should be made fire-proof. That is the law in many countries and more than one terrible sacrifice of life proves that it ought to be the law here. There is no difficulty in making stairways fire-proof. Their form permits the use either of stone or iron, and though they will act as chimneys whether they burn themselves or not, and thus give draft to the fuel, they will not spread the fire if, in addition to fire-proof stairs, the landings and parts immediately about the landings are tolerably fire-proof. It is more difficult to make hoistways that are accessible, easily managed and fire-proof, but we have no doubt that it can be done. This is fairly a subject for legislative and municipal action. As we increase in numbers, and the results of disaster become constantly greater, we grow more and more into the views upon these subjects which obtain in older countries and among more cautious people. At present our fire marshalls enquire minutely into the cause and progress of every fire, and if their conclusions were studied and applied in laws the safety of life would increase marvellously. But at present their work seems to die with their annual reports.

Ericsson's Torpedo.

THE letter of Captain ERICSSON to the Secretary of the Navy, which we publish in another column, compares the Lay torpedo boat with a movable submarine torpedo described by ERICSSON some years ago. A description of it will be found in *Engineering* for April 1, 1870, from which we take a few leading points, calculated to assist our readers in comprehending the letter referred to.

The ERICSSON torpedo is nineteen inches in diameter, and ten feet long. It is propelled by a rotary engine on board, supplied with compressed air through a half-inch tubular rope, wound upon a reel on the ship from which the torpedo starts, and unwound as the torpedo moves. Two propeller-screws are employed, revolving in opposite directions, to prevent the rotation of the torpedo itself. The range of the torpedo, that is, the length of the tubular rope, is 1500 feet. Steering is accomplished by means of a small elastic bag, attached to the side of the tiller of the torpedo's rudder. Through this bag the air passes into the engine, and by increasing or diminishing the pressure of the air, the bag is made to expand or contract sufficiently to move the tiller. The torpedo may be made to move at any desired depth in the sea by means of fins or horizontal rudders, regulated by a proper adjustment and application of the hydrostatic pressures at different depths; and its course may be indicated to the operator, in smooth water, by the formation of air bubbles on the surface, and at other times by small floats, bearing, at night, dark lanterns. The torpedo can be hauled back by the rope at any time; or, after its explosion, which severs its connection with the rope, the latter may be recovered.

It will be seen that the scope of this device, as the inventor himself declares, is limited. The advantages claimed for it are so fully set forth in Captain ERICSSON'S letter that we need not dwell upon them, further than to say that we do not fully concur with his objections to the Lay torpedo-boat, some of which he would not have offered if he had had the opportunity of inspecting the apparatus and the Newport trial itself, instead of judging by a description. At any rate, we do not see that either of these inventions covers the whole field, or need, if successful in practice, exclude the other.

Aid to Harvard.

A MEETING of Harvard graduates has been held in New York, to take measures for aiding that worthy institution in its efforts to replace the loss which falls upon it in consequence of the Boston fire. The amount of that loss, outside of insurance, was said to be $200,000, besides which $50,000 would be needed to replace loss of income, and pay extra expenses for the year. Close upon $112,000 has been contributed by other graduates and friends, and now New York is called upon to do its part. We have waited for this action, and shall watch its result with considerable interest. New York is emphatically not a college-endowing city. Considerable sums go out from it every year to country institutions, particularly of the theological order, but when all these are counted up we think New York would be found to make but a poor show, taking its wealth into account, compared with many other cities. Particularly is it lacking in that hearty support of science and discovery which would be at once judicious and graceful in its citizens. We are reading New York no lesson. The proof of what we say may be found in the history of Boston, considered in its relation to science. We have had our GRINNELL, our COOPER and other benefactors, but the record here is short, while of Boston men it is needless to give a list, for nearly every year shows proofs, in some scientific expedition, or some foundation bestowed upon Harvard, of their feeling toward the progress of knowledge. That feeling is often spoken of as one of the proofs upon which Boston may rely to sustain its claim to be the Athens of this continent; and with justice. Setting aside special cases of generosity, it is not to be denied that the merchants there give more generally and frequently than those in the larger city. We doubt if any educational institution in New York could raise two hundred and fifty thousand dollars among its well wishers in any emergency. The professional men of the city lack neither eagerness nor

energy, and the stirring scientific activity of the last ten years has not passed without an effort on their part to place themselves in the advancing line of workers. Plan after plan has been formed and failed, plans, too, which were most honorable to those who devised them and would have been creditable to any one who promoted them.

It is quite possible that the Harvard men, by transferring to New York some of the Boston spirit, may set in motion some induction currents of generosity which shall give activity to home projects. If they raise $100,000 it may be possible to obtain a quarter of a million for some of the many plans which are now patiently lying on the shelf. At all events we would like to see for the benefit of science and the honor of a rich city, something done within its own borders, for that glorious increase of knowledge which is so certain to be the product of the next half century's thought and work.

NEW PUBLICATIONS.

A POPULAR TREATISE ON GEMS, *in Reference to their Scientific Value: A Guide for the Teacher of Natural Sciences, the Lapidary, Jeweller and Amateur: together with a Description of the Elements of Mineralogy and all Ornamental and Architectural Materials. With Elegant Illustrations.* By DR. L. FEUCHTWANGER. Fourth Edition. New York: Published by the Author, No. 55 Cedar Street, 1872.

Dr. FEUCHTWANGER'S treatise has proved itself acceptable to the public for which it is designed, by the exhaustion of three editions; and doubtless the same popularity will attend the fourth edition, now before us. The book consists of three parts, of which the first deals with the elements of mineralogy, the second with gems in general, and the third with the individual species of gems. The classification is not very closely adhered to, as the Doctor never hesitates to make an excursion after some interesting or valuable fact, capture it, and return with it to his line of march. In this way he has collected under gems nearly all the useful minerals, except the ores of the metals, and even soluble glass comes in for a notice. But no one will be likely to find fault with a book for containing too much information.

We are indebted to the author for the correction of an oversight on page 214, where the constituents of the corundum and the sapphire are declared to be alumina, silica, and oxide of iron. It is well established, that pure corundum, sapphire or ruby, consists of alumina, with a trace of one or another metallic base as pigment. Silica is but an accidental constituent; and it has been shown by recent analysts, that the silica found in analyses of corundum, was probably due to the agate mortar in which the mineral was pulverized.

An alphabetical index, a chronological index of works on gems since the fifteenth century, and a table of the distinguishing characteristics of gems add greatly to the practical usefulness and convenience of this manual. We note also in the appendix to this edition an interesting account of the South African diamond fields, with diagrams (after TENNANT) of the common forms of the stones from that region. Dr. FEUCHTWANGER speaks in several places of the "Arizona" diamonds; but is too shrewd to commit himself with regard to them—in which he is wiser than the New York expert who is said to have declared that the diamonds from "Arizona" presented some entirely new and peculiar mineralogical features!

The illustrations of this book are very handsome, including an excellent portrait of the author. The style is in many places marred by inaccuracies, obscurities, or clerical or typographical errors. We defy Dr. FEUCHTWANGER himself to demonstrate any meaning, for instance, in the first paragraph on page 527; and the carelessness of the preface on page 8 is quite annoying. This single page contains thirty-nine errors. These may be small matters; but that makes them all the more unpleasant to the reader, who reflects that a good proof-reader would have rectified most of them. In spite of these defects, which we hope will be corrected in the next edition, we can recommend the book.

ENCYCLOPEDIA OF POPULAR RECEIPTS AND PROCESSES. —*Containing over 6,400 Receipts; Embracing Thorough Information, in Plain Language, Applicable to almost Every Possible Industrial and Domestic Requirement.* By WILLIAM B. DICK. New York: Dick & Fitzgerald.

The extent of this compilation, the care with which it has been edited and published, and the simple, but thorough system of arrangement and index by which its contents are made available for use in practice, combine to render it a highly valuable book. So far as we have examined it, the descriptions and formulae which it contains, appear to be accurate and judiciously selected. The list of authorities quoted and consulted by Mr. DICK, comprises the most eminent scientific periodicals of Europe and America, and goes far to guaranty the scientific value of his receipts. For the household, especially, it is calculated to be a precious *vade mecum;* while the practitioner in any industrial art will find much in its pages of special interest to him. In these days of high prices, every man has to be more or less his own tinker. From mending crockery or cleaning clothes, to concocting patent medicines, there is no branch to which he may turn his ambition that does not here receive some elucidation. The directions given, though brief, are always clear and simple, and with a few exceptions (like the seductive chapter on pyrotechny,) they can be followed without danger, even by the inexperienced.

The Changes which Coal Undergoes by Exposure.

BY H. ENGELMANN, E. M.

The subject of loss of carbon, or rather of deterioration, which stone coal suffers by exposure, has, of late, attracted much attention amongst American mining engineers and metallurgists. The different coals are not equally affected by exposure. Their texture, their chemical composition, and the impurities which they contain, exercise considerable influence. Under otherwise equal conditions those stone coals suffer most which contain a large proportion of easily decomposed hydro-carbons, or which have little cohesive strength. Gas coals, after having been stored long, make less and poorer gas than when they are fresh from the mine, and coking coals lose their coking quality, more or less; some kinds are said to deteriorate very markedly within a few days after being mined.

The nature of the changes which take place with the coal, and the conditions which influence them, still form a fruitful field for investigation. A large number of interesting experiments on this subject were made by Dr. RICHTER, Professor at the Mining School at Waldenburg, in Prussia, which deserve to be far more widely known than they appear to be in this country at least. A detailed account of them may be found in DINGLER'S Journal, 1870. I will confine myself to stating some of his principal results. As soon as the coal is mined it begins to absorb oxygen, rapidly at first, then more slowly. At first this action appears to be physical, but it soon becomes chemical, when the absorbed oxygen combines with the hydrogen of the coal to form water, and, with the carbon, to form carbonic acid. Heat intensifies the chemical action. Powdered stone coal fresh from the mine, heated to a temperature between 350 and 400 deg. Fahr., increased in weight; although carbonic acid and aqueous vapor are disengaged, more weight of oxygen is absorbed. After a while a rather constant weight is obtained, and, by chemical analysis, the coal is then found to contain oxygen and hydrogen very nearly in the relative proportion in which they combine to water, which has not been the case in the fresh coal. The property of the coal thus rapidly to absorb oxygen depends mainly upon its proportion of free hydrogen. Of the carbon of the coal only a few per cent. (5 or 6) combine thus rapidly with the oxygen at the stated temperature, while the rest of the carbon is far more stable.

Different stone coals heated to the boiling point of water until their weight remained constant, would absorb in a humid atmosphere at 60 deg. Fahr., from 2 to 7 per cent. of water, and it was remarkable to observe that some solid pitch coal would absorb three times as much water as a soft laminated coal. The faculty of absorption could not be judged from the appearance of the coal, but coals from the same stratum exhibited considerable uniformity of behavior. The coals which absorbed most water were also those which absorbed most oxygen. Twenty gramm coal absorbed in the first twenty-four hours after mining from 2 to 9 cubic centimeters oxygen. Stone coal absorbs carbonic acid even more eagerly than oxygen, taking up three times as much of it. At higher temperatures, the chemical action of the oxygen is increased, and a slow combustion takes place.

The influence of humidity on the deterioration of coal is complicated, and Dr. RICHTER'S experiments did not lead to very definite results in that respect. Air dry coal absorbs the oxygen far more rapidly than moist coal, and coal which has been artificially dried absorbs it still more eagerly, taking up at the same time some nitrogen from the air. On the other hand, humidity induces decomposition of the iron sulphuret contained in most coals, which, in turn, accelerates the chemical changes of the coal by creating heat, by causing it to split and slack, and probably, also, by inducing chemical action between the oxid of iron formed and the coal, if not between the oxygen and coal directly.

Light appears to exercise little influence. When coal has been exposed some time, and absorbs oxygen with little avidity, this absorption is a little greater in the dark. These were the principal results of Dr. RICHTER.

An interesting experiment was made some years ago in Germany to test the deterioration by exposure of silesian gas coal. A quantity of coal slack was divided in three parts. One part was directly used in the gas factory, another after having been kept one month, and the third after one month's exposure in the yard. The relative proportions of gas obtained were 135—111—95. The losses by exposure were, therefore, 17.2 per cent. and 29 5 per cent. The gas coke from the first lot was serviceable; from the second and third unserviceable.

It can hardly be doubted that this affinity of the oxygen for the coal has contributed much towards determining the quality of the coal which the different strata now present, but acting slowly in the course of ages, the effect has not been an apparent decomposition, but merely a difference of quality. The bituminous coking and gas producing coals have been least affected. They retain the largest proportion of hydrogen uncombined with oxygen and the least combined. The sinter or sand coals, which coke little or not at all, and furnish a poor gas, contain less hydrogen uncombined with oxygen, and more oxygen and hydrogen combined, than if they had been partly deteriorated by exposure. How little chemical equilibrium exists in a coal stratum is evident from the immense amount of carburetted hydrogen gas, which is evolved in the coal mines, even in those which are not subject to dangerous accumulations of it in the form of fire-damp, and which in many, especially in deeper mines, can be heard escaping in minute bubbles from the sides of the rooms, making a peculiar noise. The quality of the roof and the quality and thickness of the superincumbent rock formations have exercised an important influence in determining the quality of the coal strata. Not seldom the deeper strata of a coal basin are the most bituminous ones. The more recent brown coals, the coals which are so extensively developed throughout the region of the Rocky Mountains, which are of cretaceous age, and present the appearance of stone coals, contain generally little hydrogen compared to their large proportion of oxygen. They should, on that account, not be apt to decompose readily, but the large amount of hygroscopic water which they contain, and their lack of

cohesive strength, render many of them an easy prey to deterioration by exposure. I have seen many carloads brought into this city (Salt Lake), of which the uppermost pieces, from an exposure of several days to the scorching sun and drying winds, were cracking and exfoliating very much like burnt lime in a moist atmosphere. These coals would certainly be of superior quality if they had been buried deeper in the bowels of the earth, and protected by heavy deposits of dense rock strata, which would have prevented the loss of so much of their bitumen, and rendered the access of oxygen more difficult. These coals are, however, not equally devoid of bitumen, and a locality in Sanpete Valley, U. T., presents a curious example of the influence of a solid casing. Near the village of Wales there is an outcrop of this brown coal, which is far more bituminous than the average. It is encased between solid beds of a slaty limestone, which forms a foot wall and roof of great stability. There is no clay seam or shale intervening. The whole thickness of the bed is about forty inches at this point, which appears to diminish to both sides, but it is not all coal. In its upper part it encloses several inches of slate, and in its lower part an irregular seam of the same slaty limestone, from 0 to 10 inches in thickness. The coal itself is very solid, has a subconchoidal fracture, and, aside from the slate, contains a large proportion of ashes. Thus armor-plated against the inroads of decomposing agencies, it has retained considerable bituminous matter at the cost of purity. This coal is remarkable also on account of the vast number of small fresh water shells which are associated with it, and which must render it rich in phosphorus. Not only is the limestone above, below, and the coal full of these white shells, but the block slate is also crammed full of them, and even the coal itself near the slates.

SALT LAKE CITY, U. T., Dec. 4, 1872.

MINING SUMMARY.

New Mexico.

THE SOCORRO SILVER MINES.

Correspondence of the Rocky Mountain *News*:

Magdalena Mountains, Socorro County, New Mexico, November 15, 1872.—Knowing full well the reputation that your widely-circulated journal has attained as a disseminator of useful information to the miners of the Rocky Mountains, and the capitalists of the Eastern and Pacific States, I can conceive of no better medium for laying before the people a few facts regarding this great mineral section.

These mountains are situated in the Sierra Madre range, west of the Rio Grande, and from where I write (in the heart of the mining district) distant about eighteen miles. The district, so far as it has been prospected, extends, say twenty miles from north to south, and about twelve miles in width, the ores being carbonates of lead, bearing silver to the amount of from thirty to six hundred dollars per ton, and sulphates of copper, rich in silver also.

During the present trip I have visited many of the carbonate leads; among the more prominent of which are the "Poor Man's," "Little Fanny," "Grand Tower," "Pony," "Alpine," "Washoe," "Snoker," "Wolverine," and "Sterling," and the display of rich ores in most of them is simply wonderful.

To give you a faint idea of the richness of these ores I will cite an instance: Messrs. George Way & Co., the owners of the "Little Fanny," a short time ago smelted some average ore from that lead, in a small reverberatory furnace, of an exceedingly primitive character, and obtained 1839½ pounds of Metal. This they had separated at the St. Louis Smelting and Refining Company's works, with a result of 66 7-10 ounces of silver and 1,693 pounds of lead. The loss in cupelling was $2.10 in silver and $9 10 in lead. The freight and charges from the mine to the St. Louis works were $51.05, and the cost of reduction $25.00, (it being a small lot) making a total of $76.05. After deducting the expenses and loss in cupelling, the shippers received a net profit from the smelting company of $125.29. This was the result of an experiment made under great disadvantages, with ore assaying 70 per cent. of metal.

A few months ago, Messrs. John D. Baker & Brother bought in St. Louis, and had shipped to them and entered here, at a cost of several thousands of dollars, a large reverberatory furnace. However good this furnace may be in the reduction of the Missouri lead ores, it certainly proved a complete failure here. Notwithstanding their ill success, however, these gentlemen with the assistance of Messrs. Way & Co., immediately proceeded to and did erect a cupola furnace of small capacity, for the purpose of testing that method of reduction. It worked like a charm, and at the close of a run of nine hours, the bellows being worked by man power, had turned out upwards of 1,400 pounds of metal. This ore was also taken from the "Fanny," and the metal from it will average about the same as that sent to St. Louis:—a little more lead and a little less silver in proportion, perhaps, as the ore was worked much closer than in the small reverberatory where a good deal of lead was lost. From everything that I have seen and been able to learn, I am satisfied that the cupola furnace is the only one suitable to these carbonate ores, but the miners are poor and unable to erect them of any size, with the engines and blowers necessary. There are now in sight, of these ores, thousands upon thousands of tons, that will yield in base bullion from fifty to seventy per cent.—very little will run below $30 per ton in silver, while much will exceed $100. Probably two of the richest deposits are the Poor Man's and Little Fanny, which, where opened, are from thirty to sixty feet in width, of metal. Why will not some of our capitalists having money to invest send a good, practical man here to look into this matter of furnaces? The leads are in but few hands, and the owners generally poor. They will hold out every inducement to those who will erect furnaces and enable them to reduce their ores; and the ores are rich and inexhaustible, and wood and water plenty. I am sure capitalists cannot find a better opening in the whole Rocky mountain country than in this great silver region. The furnaces themselves would not be very expensive. The greatest bill of expenses would be for engines and blowers.

The sub-district of Corona del Pueblo, contains but little lead, but the leads seem much richer in silver than in the Carbonate district. Assays have been made of ores from all the prospected lodes in Corona district, and they give from $25 to $11,000 per ton in silver, with some copper. Ores from this district, when located, throw out the silver so that it is plainly visible to the naked eye.

The quickest method for reaching the mines is by coach from Pueblo, *via* Las Vegas, Santa Fé and Albuquerque to Limitar or Socorro, seventy-two and eighty miles respectively, south of Abuquerque. Limitar is about twenty miles and Socorro about twenty-four miles from the mines. At either of these flourishing towns conveyances to and from the mines may be had. At the mines the latch string hangs out at the cabins of Messrs. J. S. Hutchason, the pioneer of the district and proprietor of many leads, Way & Co., Bakers, Hays, Sanborn, Bingham and many others.

Pennsylvania.

(From our own Correspondent.)

Outside of Chester and Lancaster Counties in Pennsylvania, one scarcely hears of any mining operations within the limits of those counties; but at Media, recently, a bed of iron ore was discovered; also the serpentine rock, in which the ore is embedded was found to contain gold; but traces of gold in these days should not cause too great an excitement, for we all know that gold is not confined to particular counties or districts as was thought in days gone by; but can be found disseminated in almost all rocks throughout the globe in a greater or less degree.

In the neighborhood of West Chester (7 miles S. W.) a mine of corundum has been very recently opened up. This mineral has long been known in Chester County, but no veins or large deposits, as this apparently is, had been found. Many tons of it are already at the surface. It is situated between two formations—the serpentine and granite. The sapphire, the ruby and the emerald, are varieties of this mineral; also emery, which is a variety mixed with magnetite. About four miles south of Oxford, in the same county, on the P. B. & C. R. R, are the Pine Grove Chromium mines, owned by Mr. Moro Philips, of Philadelphia. These mines are 100 feet deep presenting a good vein of chromic iron ore at the bottom and a large pile on the surface. Here the influx of water necessitates 12-inch pumps and a larger and more powerful engine, which is forthcoming.

In the same formation, five miles south in Lancashire County, are the New Texas Chrome mines, owned by a New York company. These mines have been idle, but operations are to be resumed, when great results are anticipated because of their proximity to the Tyson's Chrome mines, which yielded a great amount of this mineral for nearly half a century. All of those mines are found in deposits running in a regular course in the serpentine formation, being identical with the rock in which the Chromic iron is found in California. The ore is and associated with magnesian minerals.

Maryland

[From Our Own Correspondent.]

I left Baltimore by the Baltimore and Ohio railroad, and in seven hours arrived at Cumberland, Alleghany County, Md., at which place I took the Cumberland and Pennsylvania railroad cars for Mount Savage, where I was kindly entertained by Mr. MILLHOLLAND, Vice-President of the Union Mining Company. These mines are operated on for a hard clay or rock, which underlies the coal measure, and is in proximity to the conglomerate. It runs in seams, varying from one foot to fourteen feet in thickness, and is the origin of the celebrated fire-brick manufactured at this place. Although it is wrought from under the coal it is situated nearly at the summit of Mount Savage, and is developed from the surface by means of adits. Here it is evident that, if Nature had not intervened for the welfare of her subjects, as is her wont, this hard clay, or rock, would have been many hundred feet below the surface, and would therefore have been valueless, whereas now the whole carboniferous region here is "basin"—or "trough"—shaped, exposing its synclinal axis, so that the mineral, &c., is easily taken therefrom. About fifty tons of this hard clay, which has to be blasted, is excavated daily, producing about two million bricks per year. The mode of pulverizing the clay is by a cast-iron pan turning horizontally, while two iron rollers weighing a ton and a half each revolve in it. There are five kilns belonging to the company, two of which are built on the improved style, or "down-draught plan," which is highly approved here.

At Frostburg the real characteristics of the carboniferous formation present themselves; yet the topography of the district is rather tame and unprepossessing, presenting few picturesque elevations or depressions, but the country is rich underneath in semi-bituminous coal. The Consolidation Coal Company own about 8,053 acres of this region, containing many seams of coal, the principal one being known as the fourteen-foot bed is basin- or trough shaped, somewhat resembling South Gloucestershire, England, coal pits. Its outcroppings can be traced with regularity the full length of the basin (eighteen miles), and it is situated between the "Great Savage Mountains" on the west and "Dans Mountains" on the east. Mr. THOMAS, the Superintendent of the works, escorted me through some of the mines. And allow me here to do him justice by mentioning that the whole operations are conducted on a thoroughly economical and scientific principle. Here may be seen the difference between an intelligent, practical miner, holding such a position, and one who has never operated in, nor is conversant with, mines and mining—such as we frequently see in our travels, and which is often the chief cause of abandoning mines. The mine "Ocean No. 1" yields 600 tons per day, and the product can easily be increased to 1,000 tons. "Ocean No. 2" is getting out 600 tons, but will decrease hereafter on account of its exhaustion. "Ocean No. 3" can yield 1,300 tons without any disadvantage to the mine. "Ocean No. 4" is the bottom part of the basin of the fourteen-foot seam, and may be termed, after taking all things into consideration, the key to the whole property; for, by operating at the point now under exploration, it will eventually drain the whole, especially the Eckhart Slope mine, where there is about 700,000 tons of water to be drained. Up to this time the proprietors of this region have only been developing their properties. Notwithstanding this *one* company sent off 500,000 tons last year (1871), and about the same amount this year (1872), a million could be excavated annually without being prejudicial to the general working of the mines. There are several smaller veins of coal both above and below the fourteen-foot seam, varying from one foot to four feet in thickness, but not wrought. The greatest declination is only about eleven feet to one hundred. All the main headings and rooms are laid out on paper prior to its commencement, after which everything is prosecuted with the strictest scrutiny. In summer there are employed by this company nearly 700 men; but owing to the freezing up of the canal-boats in winter, a decrease of the hands is necessary. The miners get 65 cents per ton in the rooms and 78 cents in the main headings. Strikes are unknown in this neighborhood. About two and a half miles from Frostburg is the Bowery Blast Furnace, owned by the C. C. and Iron Company, turning out eighteen to twenty tons of iron per day. The iron stone is taken from a fifty-acre lot, having a similar dip or rather *rise*, to the coal measure. From the C. C. Com-

pany's land to Longscoming, thence to Piedmont, on either side of the railroad for its whole length, lie, in a similar position, seams of coal, which will yield millions upon millions of mineral. THOMAS STEPHENS.

Colorado.

GILPIN COUNTY.

[From the Rocky Mountain News of Dec. 4]

CENTRAL CITY, Nov. 23.—We set out this morning, under the guidance of Bela S. Buell, to see some of the mining operations of the neighborhood, and succeeded in putting in a full day. First we went to his own mine—the Leavitt—situate in the gulch about half a mile below this place, and in the suburbs of Mountain City. The lode is the same known in the early days of the country as the Gregory Second. It was not remarkably rich, and its workings have been several times abandoned. As labor and supplies became cheaper, Bela thought he could begin to see a margin for profit, and having secured two thousand feet of the vein by government title he set to work in a careful kind of way. The vein is from four to eight feet wide and the ore unusually soft and easy to work. He is now mining for about three hundred feet along the vein torough two shafts, each two hundred feet deep. The work is all above that depth, and the greater share of it not more than a hundred feet below the surface. A fifty-horse-power engine does the hoisting and pumping. Forty men are employed in the mine and twelve on the surface. Miners work ten hours and receive three dollars per day. Engineers, blacksmiths, timbermen, ore-sorters, etc., work twelve hours, for which they are paid from three and a half to four dollars per day. These fifty-two men raise about fifty tons of ore per day. Of this quantity about two tons is first-class, and is sold to the smelting works at from fifty dollars to two hundred dollars per ton, net. A few lots have run higher. The other forty-eight or fifty tons is rated second-class, and yields under stamps an average of about ten dollars per ton. The total cost of mining, hauling and milling is about eight dollars per ton, leaving a net profit of two dollars.

Mr. Buell mills his own ore, in a rented mill, for which he pays six thousand dollars per year. It has fifty-five stamps, and crushes from forty to fifty tons per day. Eight or ten men are employed in and about it. The mill is a mile and a quarter from the mine, and hauling costs seventy-five cents per ton. In summer the mill is driven by water power and in winter by steam. By the former it costs two and by the latter three dollars per ton to "mill" the ore. An adequate supply of water and water power for this gulch would enable him to drain his mine, hoist his ore, and crush it at the mouth of the mine; thereby saving the seventy five cents now paid for hauling and one dollar in milling on every ton of ore reduced. This would make a difference to him of seventy-five dollars per day. There would be a further saving, however, in the power required for hoisting and pumping. Drifting costs him from four to eight dollars per foot; shaft-sinking from fifteen to twenty dollars.

Our next visit was to the Briggs mine; also in the bottom of the gulch, half a mile further down, and on the spot where Gregory made his first discovery of gold in this region. The mill stands over the mine and the same power hoists, pumps, stamps and, in fact, does almost everything else that is done above ground. Its machinery is most complete. The engine is one hundred and fifty horse power and from one-third to one-half its strength is used. It has two sets of boilers and a very complete system of pumps, safeguards and appliances. The deepest workings are five hundred feet, but owing to the great quantity of water that comes in, the lower fifty feet are abandoned for the present. Most of the ore is broken at from four hundred to four hundred and fifty feet deep. Expenses are estimated per cord, and the cost of mining and hoisting was given by Mr. Briggs at eleven and a half dollars per cord, and of milling at ten dollars. A cord is about seven tons; consequently the total expense is but a trifle over three dollars per ton, whilst the average yield is almost twelve dollars. And this is for the second class, or, in common parlance, "milling ore." The first class product goes to the smelting works. Its average value was given at $133 per ton. Systematized labor, the best of appliances and the substitution of machine for hand labor at every possible point, accounts for the comparatively low cost and large profit of manipulating ores at these works.

The Briggs mine is two hundred and forty-two feet on the Gregory and six hundred feet on the Briggs lode. The veins come together under the mill and are worked through the same shafts. Twenty-five men are employed under ground and twelve above, and their wages range from three to five dollars each per day. The mill runs but twenty-five stamps, but the arrangement is superior to that of most mills and they crush thirty-five tons per day, or, in round numbers, two hundred and fifty tons per week. Mr. Briggs stated that if they could work in the bottom of the mine, they would raise from one hundred to one hundred and fifty tons of first class ore per month. We failed to ask the present yield of that grade.

From the Brigge mine we went to the Bobtail tunnel, two or three hundred feet further down the gulch and piercing the mountain to the southward. Its primary object is to drain the Fisk, Bobtail and Gregory veins, upon all of which work has been almost abandoned for years past, on account of water. A. N. Rogers is superintendent but he is now cost for pumping and other machinery, and the work is in charge of Mr. De France, foreman. The tunnel is in 1,020 feet and will reach the Bobtail in one hundred feet further. That event is set down for January 1. About half way in it pierces the Fisk lode and that mine is already extensively worked through it. A considerable stream of water flows out of the tunnel. Near its present extremity a large stream pours in through the roof, forming a very pretty cascade. The Bobtail lode will be struck at four hundred and sixty feet below the surface and sixty feet above the deepest workings that have ever been made on that vein. A pumping engine will be placed in the tunnel over the mine named and with the comparatively short lift necessary, it will be able to drain the full length of the Bobtail and all the upper, or western, workings on the Gregory lead. These were for a long while the most productive mines in the district and it is confidently expected they will resume their old places in the production of ore.

Next we went to the Boston and Colorado Smelting Company's works, more familiarly known as Professor Hill's. They are two miles east of Central; Black Hawk being midway between. Professor Hill established his works about five years ago in the darkest days of Colorado's mining interests. The have done more, probably, than any other one thing to re-establish confidence and build up our yield of the precious metals. About twenty-five tons of ore are handled daily, of which nearly two-thirds comes direct from the mines and one-third is tailings from various mills. Their manipulation includes the ruder portions of the Swansea (Wales) process; the metals not being reduced beyond matte, which contains the gold, silver and copper of the ores. At this stage it is crushed to the average size of grains of corn, sacked and shipped to England for separation and a market. As a minute description of the process would be too lengthy for incorporation in a general letter, it will not be attempted.

The ore is purchased as it comes into the yard; its value being determined by assay. Thirty-five dollars per ton is the lowest price for which it can be reduced with any profit to the works; consequently ore must pay more than that amount to find a market. Whatever the excess over thirty-five dollars may be is the price paid;—that is upon ores that do not assay more than fifty dollars to the ton. If the value exceeds fifty dollars, and is less than one hundred dollars, the drawback for reduction is forty dollars. If over one hundred but less than one hundred and fifty dollars, the price for reduction is forty-five dollars per ton, and so on, adding five dollars for each fifty dollars of its assay value. The minimum for tailings is twenty-four dollars per ton, and the ratio of increase is in the same proportion as given above for uncrushed ores. The above applies to all ores in which gold is the principal value.

Upon silver ores the scale of prices is based as follows: Upon ore containing forty ounces of silver to the ton—which is the lowest purchased—forty-eight cents per ounce is paid in currency. If it gives forty-five ounces, the price is fifty-three cents per ounce; and so on in a regular progressive scale until at one thousand ounces per ton it commands one hundred and twenty-three and-a-half cents per ounce, or within six and-a-half cents of its real market value. The value of the copper product is rated at one dollar and a half for each per cent. of that metal. Thus, gold or silver ore that shows at the rate of twenty pounds of copper to the ton (2,000 pounds) is one per cent. copper, and its market price is hereby increased one dollar and-a-half. If it shows forty pounds, or two per cent., three dollars is added, and so on in proportion to its richness. All the contents of the ore, in gold, silver and copper, enter into the calculation of its value. On what the works call "low grade" ore—that is ranging in value from fifty to three hundred dollars per ton—the buying prices range all the way from fifty to seventy per cent. of its actual value, as determined by assay. On rich ores it runs up as high as ninety per cent. To the inexperienced in mining and milling, the above prices may look low, but the fact is that by the ordinary milling processes not near as large a proportion of the metal can by any possibility be saved as the net prices paid by these works. An intelligent and experienced miner who handles for himself eighteen or twenty thousand tons of ore per year, and who sells his higher grades to Hill, gives it as his opinion that the actual advantage to ore producers is from double up to four times the net profit upon the richer and refractory ores by the establishment of these works and the market they offer, over the best that can be done in common milling process.

The works employ fifty men, whose wages range at from three to four and a half dollars per day, with a few exceptions running up to seven dollars. Some of them are paid in proportion to the work they do and its excellence. This applies particularly to those who have charge of the roasting furnaces, where success depends entirely upon skill and care.

Last year 8,396 tons of ore passed through these works, giving an average yield in gold and silver of eighty dollars per ton, in round numbers; or a total of $671,680 in coin. During the year their capacity was considerably increased; one large smelting furnace being added to the two that were in use before. The yield will doubtless be largely increased this year.

The ore supply comes from various mines in the neighborhood; from Idaho district, Georgetown and Caribou. When the works were first built the main dependance was upon the Gregory, Bobtail, and other rich mines near by, that are now unworked. In fact, the company would not have ventured upon the enterprise but for those. For a year or two they have hardly furnished a ton of ore. It all comes from other and newer mines, scattered over a wide extent of country. It is proper to say that the very richest ores seldom reach these works. They are shipped by the mine owners themselves, in the raw state, direct to eastern or European reduction works.

MISCELLANEOUS.

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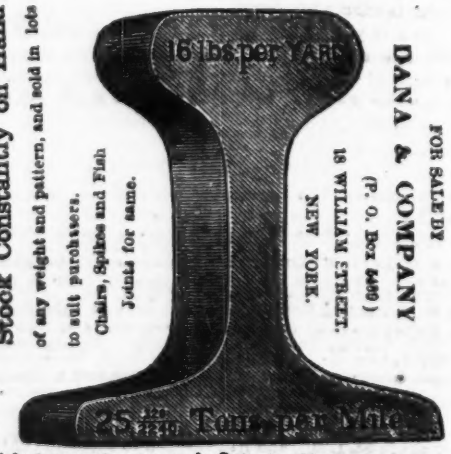

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Nov. 19:1y

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Nov. 21:1y

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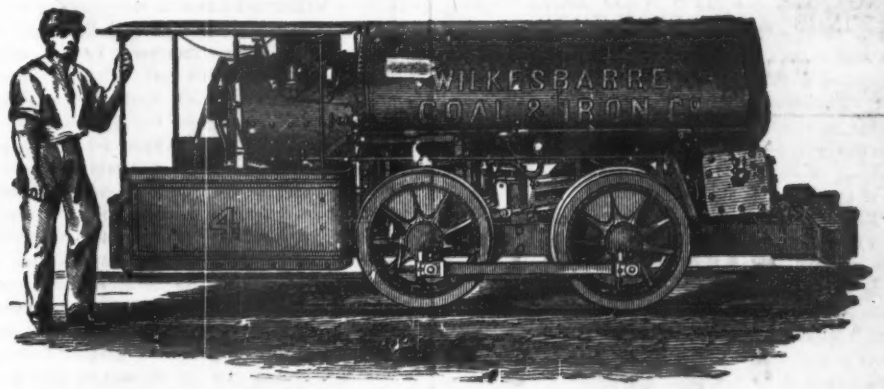

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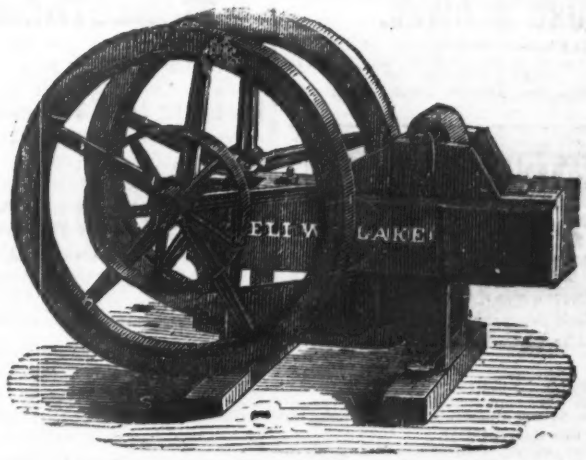

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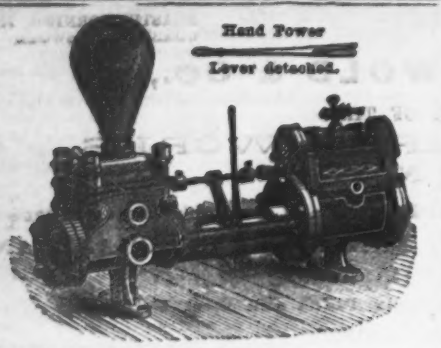

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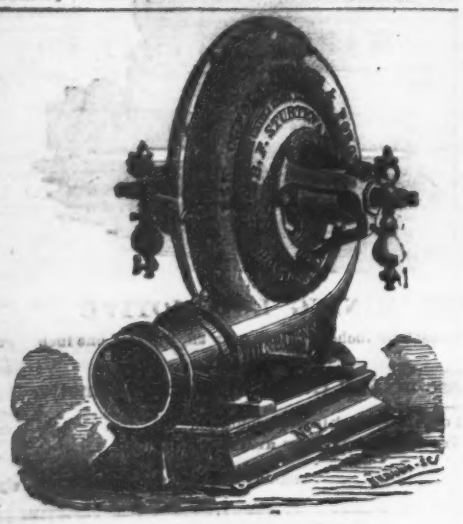

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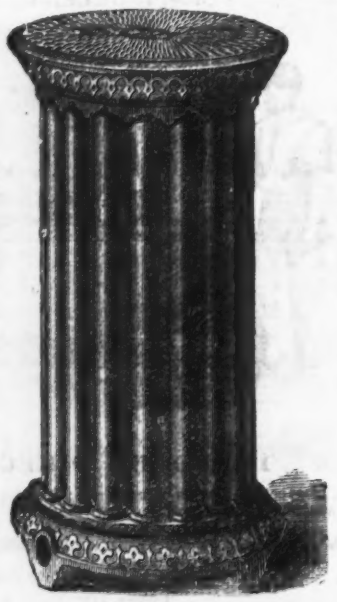

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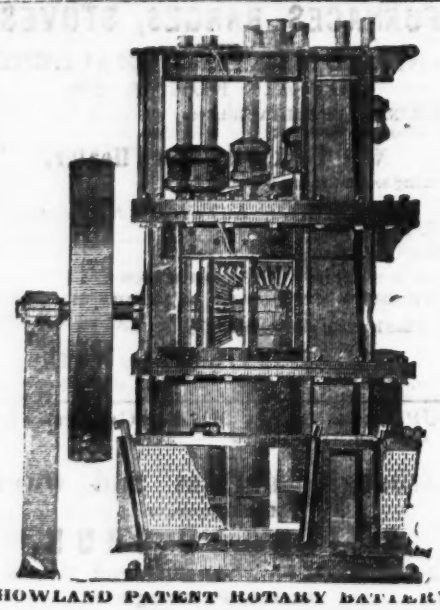

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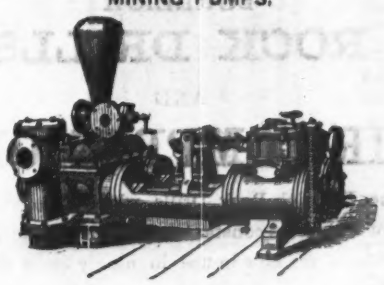

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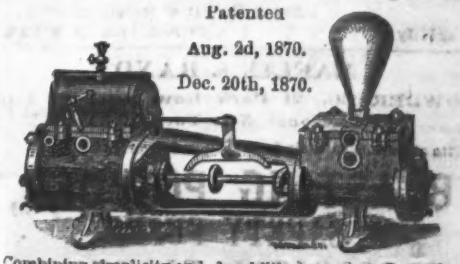

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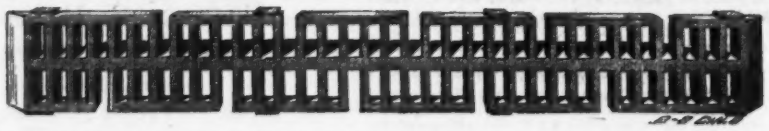

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